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SMITHSONIAN INSTITUTION

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FREER GALLERY OF ART  
OCCASIONAL PAPERS

VOLUME TWO

NUMBER TWO  
(End of Vol.)

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ABSTRACTS OF TECHNICAL STUDIES IN  
ART AND ARCHAEOLOGY

1943 - 1952

*Compiled by*  
RUTHERFORD J. GETTENS  
AND  
BERTHA M. USILTON



PUBLICATION 4176

WASHINGTON

1955

### FREER GALLERY OF ART OCCASIONAL PAPERS

The Freer Gallery of Art Occasional Papers, published from time to time, present material pertaining to the cultures represented in the Freer Collection, prepared by members of the Gallery staff. Articles dealing with objects in the Freer Collection and involving original research in Near Eastern or Far Eastern language sources by scholars not associated with the Gallery may be considered for publication.

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## FOREWORD

Within the last quarter century a new and specialized literature has developed dealing with the application of science and technology to the related fields of art and archaeology. There are two main applications of this new approach. In the first place applied science has broadened our whole knowledge of the origins, the fabrication, the chronology of materials, and the authenticity of works of art. Secondly it has given us a new understanding of the stability of materials and structures, and in turn it has developed improved methods for conserving and preserving our cultural holdings. This literature, even knowledge of its existence, will benefit scholars in the field of art and archaeology, curators, conservators, museum administrators, and all who work professionally with objects of the past and art creations of the present.

Only a minor part of the literature appears in the few art technical publications. The greater part is scattered far and wide in writings and reports devoted more particularly to the fine arts and archaeology and some that is important is hidden away in technical journals that never see the inside of a museum or an art historian's study. There is wide geographical distribution of these sources and there are the usual language barriers. The purpose of these abstracts is to learn the extent of all these scattered writings and to gather them together. The abstract method was chosen because it is the one method that can be set up as a cooperative project with resulting wide distribution of the burden.

In selecting the material to be abstracted the compilers have been consciously attempting to circumscribe a new branch of applied science. The table of contents roughly delimits this specialized field. It has been difficult, however, to know just where the boundaries lie. This has been especially true in selecting material from that part of the purely technical literature which is recognized to be even remotely useful in problems of examination and of conservation of objects of art and antiquity. They hope they have not gone too far astray. These abstracts deal mostly with artifacts—using that term in its broadest sense—and the materials from which they are made. Under Museology, subsection F entitled "Emergency Protection" is limited because that subject has been so adequately

covered by the bibliography compiled by Nelson R. Burr (see item 125). The items given here are not covered by Mr. Burr.

The 10-year period of coverage, 1943-1952, begins with the end of the decade that was covered by *Technical Studies in the Field of the Fine Arts*. In that journal, which was published for the Fogg Museum of Art, Harvard University (1932-1942), there were included many abstracts of papers in this field. In the present series there is a slight overlapping with *Technical Studies* abstracts but it ends abruptly with articles or books published prior to January 1, 1953. After that date the task of covering the writings in art technology will be carried on by a new journal, *I.I.C. Abstracts*, which will be published under the sponsorship of the International Institute for the Conservation of Museum Objects, London.

The abstracts given in French are the effort of the Belgian Working Party (*vide infra*). In the interest of accuracy it seemed better to leave those contributions in the language in which they were written.

Any assembly of bibliographical data like this contains items of widely varying importance. It is impossible to exercise critical evaluation except to give less space to articles of lesser importance and to indicate more important articles by incorporating in the abstract essential details and conclusions presented in the original paper. Unfortunately different abstractors evaluate differently. Popular articles are covered as well as highly technical ones. Only by inclusive coverage can the extent of interest in the field be judged.

This project could not have been carried out without the assistance of those who are listed here as "Contributors." These were organized as four "Working Parties," namely the British Working Party, which was headed by Mr. Stephen Rees Jones of the Courtauld Institute of Art, London; the Belgian Working Party under the direction of Dr. Paul Coremans of the Laboratoire Central des Musées de Belgique; the Japanese Working Party headed by Professor Kazuo Yamasaki of Nagoya University, Nagoya, Japan, and the American group by the compilers. Each member has unselfishly contributed time and personal interest. Dr. Harold J. Plenderleith of the British Museum Laboratory is owed an especial debt of gratitude for moral support and advice. Mr. Archibald G. Wenley, Director of the Freer Gallery of Art, has made this project possible. About one-fourth of these abstracts have been "lifted"

with permission from other abstract journals. These include: *Chemical Abstracts* of the American Chemical Society; *Abstract Review* of the National Paint, Varnish and Lacquer Association, Washington, D. C.; *Review* published by the Research Association of British Paint, Colour and Varnish Manufacturers, London; *Journal of the Iron and Steel Institute*, London; *Library Literature*, H. W. Wilson Co., New York. In many cases the abbreviated forms used in the original abstract have been kept.

Much of the early collecting was done when one of the compilers was on the staff of the Fogg Art Museum, Harvard University. The privileges granted there are much appreciated.

RJG  
BMU

Freer Gallery of Art  
March 1, 1955.



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## CONTRIBUTORS

Initials of abstractors arranged alphabetically	Contributors and museum affiliation
AEW	A. E. Werner, Research Chemist National Gallery Laboratory London, England.
BMU	Mrs. Bertha M. Usilton, Librarian Freer Gallery of Art Smithsonian Institution Washington, D. C.
DG	Denise Goorieckx, Chemist Laboratoire Central des Musées de Belgique Brussels, Belgium.
EHJ	Elizabeth H. Jones, Conservator Fogg Museum of Art Harvard University Cambridge, Massachusetts.
ERC	Professor Earle R. Caley, Vice-Chairman Department of Chemistry The Ohio State University Columbus, Ohio.
FD	Fernand Devreux, Chemist Laboratoire Central des Musées de Belgique Brussels, Belgium.
HB	Harold Barker, Senior Experimental Officer British Museum Laboratory London, England.
HPS	Harold Philip Stern, Assistant in Japanese Art Freer Gallery of Art Smithsonian Institution Washington, D. C.

- IG Ione Gedye, Head of the Technical Department  
Institute of Archaeology  
University of London  
London, England.
- JAP John Alexander Pope, Assistant Director  
Freer Gallery of Art  
Smithsonian Institution  
Washington, D. C.
- JT Jean Thissen, Attaché  
Laboratoire Central des Musées de Belgique  
Brussels, Belgium.
- KT Kenzo Toishi, Curator  
Tokyo Bunkazai-Kenkyujo (Institute of Research for  
Cultural Properties, Tokyo)  
Tokyo, Japan.
- KY Kazuo Yamasaki, Professor of Inorganic Chemistry  
Faculty of Science  
Nagoya University  
Nagoya, Japan.
- LB Leo Biek, Head of the Ancient Monuments Laboratory  
Ministry of Works  
London, England.
- MB Mavis Bimson, Experimental Officer  
British Museum Laboratory  
London, England.
- NLB Nancy Lee Brown, Fulbright Scholar  
Laboratoire Central des Musées de Belgique  
Brussels, Belgium.
- PC Paul B. Coremans, Directeur  
Laboratoire Central des Musées de Belgique  
Brussels, Belgium.
- RDB Richard D. Buck, Director  
Intermuseum Laboratory  
Allen Art Building  
Oberlin, Ohio.

- RJG      Rutherford John Gettens, Associate in Technical Research  
Freer Gallery of Art  
Smithsonian Institution  
Washington, D. C.
- RL      René Lefève, Collaborateur Scientifique  
Laboratoire Central des Musées de Belgique  
Brussels, Belgium.
- RLF      Robert L. Feller, Fellow  
Mellon Institute of Industrial Research  
University of Pittsburgh  
Pittsburgh, Pennsylvania.
- RMM      R. Margaret Medley, Librarian  
Department of Chinese Art and Archaeology  
Courtauld Institute of Art  
University of London  
London, England.
- RMO      R. M. Organ, Experimental Officer  
British Museum Laboratory  
London, England.
- SR      Stuart Raynolds, Junior Fellow  
Mellon Institute of Industrial Research  
University of Pittsburgh  
Pittsburgh, Pennsylvania.
- SRJ      Stephen Rees Jones, Lecturer in Charge  
Technology Department  
Courtauld Institute of Art  
University of London  
London, England.

## PERIODICAL ABBREVIATIONS

Abbreviations arranged alphabetically	Full title, and place of publication and date of first issue (where known)
A.A.	Archaeologischer Anzeiger. Berlin. 1889.
A.A.S.O.R.	Annals of the American School of Oriental Research. New Haven, Conn. 1919.
A.B.S.A.	Annals of the British School at Athens. London. 1894.
A.C.A.S.A.	Archives of the Chinese Art Society of America. New York. 1945.
Acta Arch.	Acta archaeologia. Academie Scientiarum Hungaricae. Text in English, French, German, and Russian. Budapest, 1950.
Actas y trabajos Congr. peruano quím.	Actas y trabajos del congreso peruano de química. Lima, Peru. 1949.
Alumni	Alumni. Revue du cercle des alumni des fondations scientifiques ayant leur siège . . . à Brussels.
Amer. Ant.	American antiquity. University of Utah, Salt Lake City, Utah. 1935.
Amer. Archiv.	American archivist. Society of American Archivists. Bethesda, Md. 1938.
Amer. Cer. Soc. Bull.	American Ceramic Society bulletin. Columbus, Ohio. 1918.
American chemical society. See Anal. Chem.; C.A.; Chem. Eng. News; Ind. Eng. Chem.; J. Amer. Chem. Soc.; J. Phys. Chem.	
Amer. Foundrym.	American foundryman. American Foundrymen's Society. Chicago. 1938.
Amer. Ink Maker	American ink maker . . . for manufacturers of printing inks and colors. New York. 1923.
Amer. J. Archaeol.	American journal of archaeology. Archaeological Institute of America. Cambridge, Mass. 1885.



- Amer. J. Roentgenol. Radium Therapy Nuclear Med.      American journal of roentgenology, radium therapy and nuclear medicine. Springfield, Ill. 1906.
- Amer. J. Sci.      American journal of science; devoted to the geological sciences and to related fields. New Haven, Conn. 1818.
- Amer. Mineral.      American mineralogist. Mineralogical Society of America. Washington, D. C. 1916.
- Amer. Paint J.      American paint journal. St. Louis, Mo. 1916.
- American philosophical society.  
See Proc. Amer. Phil. Soc.
- Amer. Rifleman      American rifleman. National Rifle Association of America. Washington, D. C. 1885.
- American school of oriental research. See A.A.S.O.R. and B.A.S.O.R.
- Anal. Chem.      Analytical chemistry. (Formerly Analytical Edition of Industrial and Engineering Chemistry but issued as a separate journal beginning with Jan. 1947 under the title, Analytical Chemistry.) American Chemical Society. Washington, D. C. 1929.
- Anales real Soc. españ. fís. y quím.      Anales de la real Sociedad española de física y química. Madrid. 1903.
- Analyst      The Analyst; journal of public analysts and other analytical chemists. Cambridge, England. 1876.
- Anc. India      Ancient India; bulletin of the archaeological survey of India. New Delhi. 1946.
- Angew. Chemie      Angewandte Chemie. Gesellschaft deutscher Chemiker. Weinheim, Germany. 1888.
- Ann. App. Biol.      Annals of applied biology. Association of Applied Biologists. London. 1914.
- Ann. biol. clin. (Paris)      Annales de biologie clinique. Bulletin de la Société française de biologie clinique. Paris. 1943.
- Ann. Chim.      Annali di chimica. Rome. 1914. Formerly Annali di chimica applicata. Name changed with vol. 40, No. 1 (Jan. 1950).

- Ann. Est. (Nancy) Annales de l'Est. Université Faculté des Lettres, Nancy. Nancy, France. 1887.
- Ann. inst. tech. bâtiment et trav. publ. Annales de l'institut technique du bâtiment et des travaux publics. Paris. 1948.
- Ann. Sci. Annals of science; a quarterly review of the history of science since the renaissance. London. 1936.
- Ann. Ser. Ant. Egypte Annales du Service des Antiquités de l'Egypte. Cairo. 1900.
- Ant. J. Antiquaries journal. London. 1921.
- Antiques Antiques; a magazine for collectors and others interested in times past. . . . New York. 1922.
- Antiquité class. Antiquité classique. Brussels. 1932. Contributions in French, Dutch, German, etc.
- Antiquity Antiquity; a quarterly review of archaeology. Ashmore Green, Newberry, Berks, England. 1927.
- Apollo (The Hague) Apollo; maandschrift voor literatur en kunsten. Den Hague. 1945.
- Apollo (London) Apollo; the magazine of the arts for connoisseurs and collectors. Norwich, England, 1925.
- Arch. bibl. musées belgique Archives, bibliothèque et musées de belgique. Brussels. 1923. Text in Flemish and French.
- Arch. Hérald. Suisses Archives héraldiques Suisses. Schweizer Archiv für Heraldik. Zurich, Switzerland. 1887.
- Arch. Rec. Architectural record. New York. 1891.
- Archaeology Archaeology; a magazine dealing with the antiquity of the world. Cambridge, Mass. 1948.
- Archeion (Santa Fe) Archeion; Archivio de historia de la ciencia. Archivio di storica della scienze. Archives for the history of science. Santa Fe (Republic of Argentina). 1919. Title varies.
- Archeion (Warsaw) Archeion; czasopismo naukowe poświęcone sprawom archiwalonym. Warsaw. 1927. Added title page: Archeion; revue des archives.

- Archiv Eisenhüttenw.      Archiv für das Eisenhüttenwesen (Verein deutscher Eisenhüttenleute und Max-Planck- Institut für Eisenforschung). Düsseldorf, Germany. 1927.
- Archiv Metallkunde      Archiv für Metallkunde. Discontinued with vol. 3, No. 12 (Dec. 1949). Merged in Werkstoffe und Korrosion, which began with vol. 1, No. 1 (Jan. 1950).
- Archives (Brit.)      Archives; journal of the British Records Association. London. 1949.
- Archivio Stor. Nap.      Archivio storivio per la province napoletane. Naples. 1876.
- Art Bull.      The Art bulletin. College Art Association. New York. 1913.
- Art Digest      Art digest. New York. 1926.
- Art Mat. Trade News      Art material trade news; news of the art supply trade. Chicago. 1949.
- Art News      Art news. New York. 1902.
- Art Quart.      The Art quarterly. Detroit Institute of Arts. Detroit, Mich. 1938.
- Artibus Asiae      Artibus Asiae . . . devoted to Asiatic research. Ascona, Switzerland. 1952. Text in English, French, or German.
- Athār      Athār-é-Iran. Annales du service archaéologique de l'Iran. Haarlem. 1936.
- Atti. accad. sci. Torino. Classe sci. fis. mat. e nat.      Atti della accademia delle scienze di Torino. Classe di scienze fisiche, matematiche e naturali. Turin, Italy. 1950/51.
- Australian Plastics      Australian plastics. Plastics Institute of Australia. Sydney, Australia. 1946.
- B.A.H.B.      Bulletin des Musées royaux d'art et d'histoire. Bruxelles. 1901.
- B.A.S.O.R.      Bulletin of the American School of Oriental Research. New Haven, Conn. 1919.
- Beit. Geol. Schweiz. Geotech. Ser.      Beiträge zur Geologie der Schweiz. Geotechnische Serie. Bern, Switzerland, 1862.
- Belgium      Belgium. Belgium Press Association. New York. 1941.
- Bibl. Archaeol.      Biblical archaeologist. New Haven, Conn. 1938.

- Bibliotekar' Bibliotekar'. Gosudarstvennaia Ordena Lenina Biblioteka Soiuza S.S.S.R. Moscow. Nos. 7-12, 1948.
- Bijutsu kenkyū. Bijutsu kenkyū. Journal of art studies. Tokyo, 1932. In Japanese with English summaries.
- Bijutsu shi Bijutsu shi. Journal of art history. Benrido and Company. Tokyo and Kyoto, 1950.
- B.F.M.A. Bulletin of the Fogg Museum of Art. Harvard University. Cambridge, Mass. 1931.
- Bl. Bergshand. Örebro Blad för Bergshendternigens Vänner inom Örebro. Stockholm, Sweden. No. 4 (1949).
- B.M.F.A. Bulletin of the Museum of Fine Arts. Boston, 1903.
- B.M.M.A. Bulletin of the Metropolitan Museum of Art. New York. 1906.
- B.M.Q. British museum quarterly. London. 1927.
- Boer en Spade Boer en Spade. Holland. 1947. En langue néerlandaise avec résumé en langue anglaise.
- Bol. min. ind. (Bilbao) Boletín minero e industria (Bilbao). Bilbao, Spain. In Spanish.
- Bol. Museu Nacional Arte Antiga Boletim dos Museu Nacional de Arte Antiga. Lisbon. 1939. In Portugese and French.
- Bol. Univ. Santiago Comp. Boletín de la Universidad de Santiago de Compostela. Santiago, Spain. 1910.
- Boll. ist. centrale restauro Bollettino dell'istituto centrale del restauro. Rome. 1950.
- Boll. ist. patologia libro (Rome) Bollettino dell istituto di patologia del libro. Rome. 1939.
- Boll. soc. natr. Napoli Bolletino della società dei naturalisti in Napoli. Naples, Italy. 1887.
- B.P.V. Review of current literature relating to the paint, colour, varnish and allied industries. London. 1928.
- Brit. Abs. British abstracts. Ser. A-C. Formerly British chemical and physiological abstracts. London. 1944.
- British ceramic society  
See Trans. Brit. Ceram. Soc.

- Brit. J. Ind. Med.      British journal of industrial medicine. London. 1944.
- Brit. Pap. Bd. Makers' Assoc.      British Paper and Board Makers' Association. Formerly Paper Makers' Association of Great Britain & Ireland. Proceedings of technical section. Surrey, England, 1950.
- Brit. Plastics      British plastics. Formerly British plastics and moulded products trader. London. 1929. Name changed with vol. 17, No. 188 (Jan. 1945) to British plastics.
- Brit. Steelmstr.      British steelmaster; a monthly review of the steel industry. London. 1935.
- Brooklyn Mus. Bull.      Brooklyn museum bulletin. Brooklyn Institute of Arts and Sciences. 1939.
- Brooklyn Mus. J.      Brooklyn museum journal. Brooklyn Institute of Arts and Sciences. 1942.
- Buddhist Art      Buddhist art. (Bukkyō geijutsu). Tokyo. Aug. 1948. In Japanese with contents and list of illustrations also in English.
- Bull. Allen Mem. Mus.      Bulletin of the Allen Memorial Art Museum, Oberlin College. Oberlin, Ohio. 1944.
- Bull. Amer. Cer. Soc.      Bulletin of the American Ceramic Society. Formerly issued in the Journal of the American Ceramic Society and later in Ceramic Abstracts and the Bulletin of the American Ceramic Society. Beginning with vol. 25, No. 1 (Jan. 1946) it was again issued separately under the name: The American Ceramic Society Bulletin.
- Bull. assoc. techn. ind. pap.      Bulletin de l'association technique de l'industrie papetière. Paris. 1947. Supplement to Papetière.
- Bull. Centre Études      Bulletin du Centre d'études, de recherches et d'assais scientifiques des constructions du génie civil et l'hydraulique fluviale. Brussels. 1946.
- Bull. Chem. Soc. Japn.      Bulletin of the Chemical Society of Japan. Tokyo. Vol. 24 (1951). In English, French, or German.
- Bull. Cleveland M.A.      Bulletin of the Cleveland Museum of Arts. Cleveland, Ohio. 1914.



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| Bull. Conn. Hist. Soc.                         | Bulletin of the Connecticut Historical Society. Hartford, Conn. 1934.   |
| Bull. Inst. Pap. Chem.                         | Bulletin of the Institute of Paper Chemistry. Appleton, Wis. 1930.  |
| Bull. Kon. Ned. Oud. Bond                      | Bulletin van den Koninklijke Nederlandse Oudheidkundige Bond. Leiden. 6th ser. 1948. In Dutch with English resumé.  |
| Bull. Mus. Roy. Hist. Natr. Belg.              | Bulletin Musée royal d'histoire naturelle de Belgique. Brussels. 1882.  |
| Bull. Natl. Arch. (U.S.)                       | Bulletin of the National Archives. Washington, D. C.  |
| Bull. Roy. Ont. M.A.                           | Bulletin of the Royal Ontario Museum of Archaeology. Toronto, Ont., Canada. 1923.   |
| Bull. soc. belge géol. paléontol. et d'hydrol. | Bulletin de la société belge de géologie de paléontologie et d'hydrologia. Brussels. 1919.  |
| Burl. Mag.                                     | The Burlington magazine. London. 1903.  |
| C.A.   | Chemical abstracts. American Chemical Society. Washington, D. C. 1907.  |
| Cahiers arch. hist. Alsace (Strasbourg)        | Cahiers d'archéologie et d'histoire d'Alsace. Strasbourg.   |
| Can. Paint Varnish Mag.                        | Canadian paint and varnish magazine. Toronto, Ont., Canada. 1927.   |
| Carinthia II                                   | Carinthia II. Mitteilungen des Naturhistorischen Landesmuseums für Kärnten. Klagenfurt. 1891.   |
| Carnegie Mag.                                  | Carnegie magazine. Carnegie Institute. Pittsburgh, Pa. 1927.  |
| C.E.   | Chronique d'Egypte. Brussels. 1925.   |
| Ceramic Abstracts                              | Issued as part of the Journal of the American Ceramic Society, which see.   |
| Chalmers Tek. Högsk. Handl.                    | Chalmers tekniska högskolas Handlinger. Transactions of Chalmers University of technology, Gothenburg, Sweden. Nr. 1. 1941. Printed in English, German, or Swedish. |
| Chem. & Ind.                                   | Chemistry and industry. London. 1881.   |
| Chem. Eng. Dig.                                | Chemical engineers digest. (Kagaku kōgyō shiryō). Tokyo.  |
| Chem. Eng. News                                | Chemical and engineering news. American Chemical Society. Washington, D. C. 1923.   |

- Chem. Met. Eng.      Chemical and metallurgical engineering. New York. 1902.
- Chem. Weekblad      Chemisch-weekblad. Nederlandse Chemische Vereniging. Amsterdam. 1903.
- Chem. Zentr. Pt.      Chemische Zentralblatt; vollständiges Repertorium für alle Zweige der reinen und angewandten Chemie. Berlin. 1830. Issued in two parts without a volume number.
- Chem. Ztg.      Chemiker-Zeitung mit Chemie Börse; Fachzeitschrift und Nachrichtenblatt für Wissenschaft, Industrie und Handel. Heidelberg, Germany. 1876.
- Chemie, Die.      Suspended publication with vol. 58, No. 5/6-7/8 (Feb. 1945). Resumed publication in 1947 as *Angewandte Chemie*, as vol. 59, No. 1.
- Chicago Nat. Hist. Mus. Bull.      Chicago Natural History Museum. Bulletin. Chicago. 1930.
- Chim. ind. agr. biol.      Chimica nell'industria nell'agricoltura, nella biologia e nelle realizzazioni corporative. Discontinued with Dec. 1943, vol. 19, No. 12. Resumed publication with Jan. 1946 as *Chimica* (Milan), which see also.
- Chim. peint. vernis      Chimie des peintures et vernis. Same as *Industria della vernice*, which see.
- Chim. peintures      Chimie des peintures. Brussels. 1938.
- Chimica (Milan)      Chimica; rivista mensile per la diffusione della cultura chimica. Istituto Italiano di storia della Chimica. Milan, Italy. 1946.
- Chimie et Ind.      Chimie et industrie. Paris. 1917.
- Chronicle. Cooper Union      Chronicle of the Museum for the Arts of Decoration of the Cooper Union. New York. 1934/35.
- Ciencia e invest. (Buenos Aires)      Ciencia e investigación. Asociación argentina para el progreso de las ciencias. Buenos Aires. 1945.
- College Art J.      College art journal. College Art Association of America. New York. 1941.
- Compt. Rend.      Comptes rendus hebdomadaires des séances de l'academie des sciences. Paris. 1835.

- Compt. Rend. A.I. Comptes rendus de l'académie des inscriptions, et belles lettres.
- Connoisseur The Connoisseur. London. 1901.
- Conservation Studies in conservation. Journal of the International Institute for the Conservation of Museum Objects. London. 1952. In French or English. Original articles concerned with the theory and practice of conservation in art and archaeology.
- Current Sci. (India) Current science. Current Science Association. Bangalore. 1932.
- Denkikagaku kyōkai, Tokyo.  
See J. Electrochem. Soc.  
Japn.
- Dept. Sci. Ind. Research Department of scientific and industrial research. (British government.) National buildings studies, Bulletin. London.
- (Brit.) Natl. Bldg. Studies, Bull.
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- Dyestuffs Dyestuffs. National Aniline Division, Allied Chemical and Dye Corp. New York. 1899.
- Dyna Dyna. Asociación nacional de ingenieros industriales de España. Madrid. 1926. In Spanish.
- East and West East and West; quarterly review published by the Istituto Italiano per il Medio ed Estremo Oriente. Year 1, No. 1 (1950).
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| Econ. Geol.                   | Economic geology and the Bulletin of the Society of Economic Geologists. Urbana, Ill. 1905.  |
| Edg. Allen News               | Edgar Allen News. Sheffield, England. 1919.  |
| Endeavour                     | Endeavour; a quarterly review designed to record the progress of the sciences in the service of mankind. London. 1942.   |
| Eng. Min. J.                  | Engineering and mining journal. New York. 1866.  |
| Engineering                   | Engineering. London. 1866.   |
| Farbe u. Lack                 | Farbe und Lack; Zentralblatt der Farben- und Lack-Industrie und des Handels. Hannover. 1906.   |
| Farben, Lacke, Anstrichstoffe | Farben, Lacke, Anstrichstoffe. Stuttgart? Name changed with vol. 5 (Jan. 1951) to Deutsche Farben-Zeitschrift, which also see.   |
| Farben-Ztg.                   | Farben-Zeitung. Berlin. Discontinued with vol. 48, No. 11/12 (1943). Merged in Lack und Farben Zeitschrift, April 1943. Ceased publication about 1944. Reappeared as Farbe und Lack in Oct. 1947 (no volume given). Vol. 54 was assigned on the Jan. 1948 issue. |
| Farm. neuva (Madrid)          | Farmacia neuva. Revista científico profesional. Madrid, Spain. Vol. 7 (1942).  |
| F.E.C.B.                      | Far eastern ceramic bulletin. Far Eastern Ceramic Group. Cambridge, Mass. 1948.  |
| Fette u. Seifen               | Fette und Seifen; einschliesslich der Anstrichmittel. Deutsche Gesellschaft für Fettwissenschaft. Hamburg, Germany. 1894.  |
| Figaro littéraire             | Figaro littéraire. Paris. 1946.  |
| Fonderie belge                | Fonderie belge. Association technique de Belgique. Brussels.   |
| Forschungen u. Fortschr.      | Forschungen und Fortschritte, Korrespondenzblatt der Deutschen Wissenschaft und Technik. Berlin. 1925.   |
| F.P.L. Reprints               | Forest Products Laboratory, Madison, Wis. Reprints.  |

F.P.L. Tech. Note	Forest Products Laboratory, Madison, Wis. Technical note.
F.P.R.L.	Forest Products Research Laboratory. Gt. Brit. Dept. of Scientific & Industrial Research.
Gaz. Beaux-arts	Gazette des beaux-arts. Paris. 1859. Text in English and French.
Gemmologist	Gemmologist; for dealers, connoisseurs, jew- ellers, designers, mounters. London, 1931.
Gems and Gemol.	Gems and gemmology. Gemological Insti- tute of America. Los Angeles, Calif. 1934.
Gentsche Bijdragen Kunst- gesch.	Gentsche Bijdragen tot de Kunstgeschiedenis. Ghent Universiteit Hooger Institut voor Kunstgeschiedenis en Oudheidkunde. Ant- werp. 1934.
Geol. Mag.	Geological magazine. Hertford, Herts., Eng- land. 1864.
Giesserei	Giesserei; Zeitschrift für das gesamte Gies- sereiwessen. Düsseldorf, Germany. 1914.
Glas-Email-Keramo-Technik	Glas-Email-Keramo-Technik. Hamburg. 1950. Continuation of Die Glashütte.
Glashütte	Die Glashütte. Discontinued with vol. 76. Merged with Glas-Email-Keramo-Technik, beginning vol. 1, No. 1 (1950).
Glass Ind.	The Glass industry; devoted to glass tech- nology, engineering, materials and glass factory equipment and operation. New York. 1920.
H.J.A.S.	Harvard journal of Asiatic studies. Harvard- Yenching Institute. Cambridge, Mass. 1936.
Harvard Lib. Bull.	Harvard library bulletin. Harvard University Library. Cambridge, Mass. 1947.
Heating & Ventilating	Heating and ventilating including air condi- tioning, piping, refrigeration and air sani- tation. New York. 1904.
Hesperia	Hesperia; journal of the American School of Classical Studies at Athens. Cambridge, Mass. 1932.



- Hutn. List.      Hutnické Listy. (Czechoslovakia. Ministerstvo hutního průmyslu a rudných dolů). Monthly journal of the Ministry of Metallurgical Industry and Ore Mines. Brno. 1946.
- ICOM News      News bulletin published by the International Council of Museums. Paris. 1948. In French and English.
- I.L.N.      Illustrated London news. London. 1842.
- Ind. Eng. Chem.      Industrial and engineering chemistry. (Formerly issued as the Industrial Edition.) American Chemical Society. Washington, D. C. 1909.
- Ind. Eng. Chem.  
Anal. Ed.      Industrial and engineering chemistry, Analytical Edition. Formerly sold only as a unit with the Industrial Edition. Issued as a separate journal beginning with Jan. 1947 under the name Analytical Chemistry, which see.
- Ind. Finishing (Indianapolis)      Industrial finishing; published in the interest of product cleaning and painting. Indianapolis, Ind. 1924.
- Ind. Finishing (London)  
Ind. Vernice      Industrial finishing. London. 1948.  
Industria della vernice. Lack- und Farben-Chemie. Chimie des peintures et vernis. Text in French, German, and Italian. Milan, Italy. 1947.
- Indian Archives      Indian archives. Published quarterly by the National Archives of India. Queensway, New Delhi, India. Jan. 1947.
- Ingenieur      De Ingenieur; weekblad gewijd aan de techniek en aanverwante Wetenschappen. Utrecht. 1886.
- Inst. belge études chinoises      Institut belge des hautes études chinoises. Rapports. Brussels. 1929/31.
- Inst. Brit. Foundrym. Foundry  
Trade J.      Institute of British foundrymen. Edward William lecture. Foundry trade journal.
- Inst. Brit. Foundrym. Papr.      Institute of British foundrymen. Paper.
- Inst. Spokesman      Institute spokesman. National Lubricating Grease Institute. Kansas City, Mo. Vol. 15. 1952.

Instituto para a alta cultura,

Lisbon

*See* Portugaliae physica

Interchem. Rev.

Interchemical review. Research Laboratories of the Interchemical Corporation. New York. 1942.

International criminal police review.

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Iron and steel. London. 1939.

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Iscor news. Iron and Steel Corporation. Pretoria, S. Africa. 1936.

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Isis; an international review devoted to history of science and civilization. Cambridge, Mass. 1913.

J. Amer. Ceram. Soc.

Journal of the American Ceramic Society. Ceramic abstracts. Columbus, Ohio. 1918.

J. Amer. Chem. Soc.

Journal of the American Chemical Society. Washington, D. C. 1879.

J. Amer. Leather Chem. Assoc.

Journal of the American Leather Chemists' Association. University of Cincinnati, Dept. of Leather Research. Cincinnati, Ohio. 1906.

J. Amer. Oil Chem. Assoc.

Journal of American Oil Chemists' Association. Chicago. 1917.

J. Anth. Soc. Japn.

Journal of Anthropological Society of Japan. (Jinruigaku zasshi). Tokyo. 1884. Text in Japanese. Title, contents page, and summaries in English.

J.A.O.S.

Journal of the American Oriental Society. (Supplements). Baltimore, Md. 1843.

J. Appl. Phys.

Journal of applied physics. American Institute of Physics. New York. 1930.

J. Chem. Educ.

Journal of chemical education. American Chemical Society. Easton, Pa. 1924.

J. Chem. Ind.

Journal of the chemical industry. London. Discontinued with vol. 69 (Dec. 1950).

J. Chem. Soc. Japn.

Journal of the Chemical Society of Japan. (Nihon kagaku zasshi.) Tokyo. 1885. In Japanese with summaries in English.

J. Chem. Soc. London

Journal of the Chemical Society. London. 1841.

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| J. Dec. Art                                    | Journal of decorative art. Manchester, England. 1881.  |
| J. Egypt. Arch.                                | Journal of Egyptian archaeology. Egypt Exploration Society. London. 1914.  |
| J. Electrochem. Soc. Japn.                     | Journal of Electrochemical Society of Japan. (Denki kagaku.) Tokyo. 1933. Text in Japanese with title, contents page, and summaries in English.  |
| J. Gemmol.                                     | Journal of gemmology and Proceedings of the Gemmological Association of Great Britain. London. 1947.   |
| J. Incorp. Clerks of Works<br>Assoc. Gt. Brit. | Journal of the Incorporated Clerks of Works Association of Great Britain. Name changed after vol. 63 (1946) to Journal of the Institute of Clerks of Works of Great Britain.           |
| J. Indus. Hyg. Toxicol.                        | Journal of Industrial Hygiene and Toxicology. Baltimore, Md. 1919. Discontinued with vol. 31, No. 6 (Nov. 1949). Merged with Archives of Industrial Hygiene and Occupational Medicine. |
| J. Inst. Metals.<br>Metallurgical Abstr.       | Journal of the Institute of Metals and Metallurgical Abstracts. London. n.s., vol. 1, 1934.  |
| J. Iron Steel Inst. (London)                   | Journal of the Iron and Steel Institute. Supersedes its Transactions. London. 1869.  |
| J. Oil Col.                                    | Journal of the Oil and Colour Chemists' Association. London. 1918.   |
| J. Phys. Chem.                                 | Journal of physical chemistry. Name changed Jan. 1947 to Journal of Physical & Colloid Chemistry. Name changed back again in 1952. American Chemical Society. Baltimore, Md. 1896.     |
| J. Phys. & Colloid Chem.                       | Journal of physical & colloid chemistry. Formerly Journal of Physical Chemistry. Name changed back again with vol. 56, No. 1 (Jan. 1952).  |
| J. Polymer Sci.                                | Journal of polymer science. New York. 1945. Formerly Journal of Polymer Research.  |
| J. Quekett Microscop. Club                     | Journal of the Quekett Microscopical club. London. Ser. 3 (1938).  |

- J. Res. Nat. Bur. Stands. Journal of research of National Bureau of Standards. Washington, D. C. 1928.
- J. Roy. Inst. Br. Arch. Journal of the Royal Institute of British Architects. (Supplement: Building research station digest.) London. 1893.
- J. Roy. Soc. Arts Journal of the Royal Society of Arts. London. 1852.
- J. Soc. Chem. Ind. Japn. Journal of the Society of Chemical Industry, Japan. (Kōgyō kagaku zasshi.) Tokyo. Printed in Japanese. A supplemental binding was issued which contained articles and abstracts in English, German, French, or Esperanto. Discontinued with vol. 50, No. 6 (Dec. 1947). Continued as Journal of the Chemical Society of Japan, Industrial Chemical Section, with vol. 51, No. 1 (Mar. 1948).
- J. Soc. Dyers Colourists Journal of the Society of Dyers and Colourists. Bradford, Yorks, England. 1884.
- J. Soc. Leather Trades' Chemists Journal of the Society of Leather Trades' Chemists. Croyden, England. 1948.
- J. Textile Inst. Journal of the Textile Institute. Transactions. Manchester, England. 1910.
- J. Walters Art Gallery Journal of the Walters Art Gallery. Baltimore, Md. 1938.
- Jahress. Mitteldtsch. Vorges. Jahresschrift für Mitteldeutsche Vorgeschichte. Bd. 33 (1949).
- Japn. Ind. Art. Japanese industrial art. (Nihon bijutsu kōgei). Ooka. In Japanese with English title page and contents.
- Jinruigaku zasshi.  
See J. Anth. Soc. Japn.
- Kagaku kōgyō shiryō.  
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- Kagaku to kōgyō. See Bull.  
Chem. Soc. Japn.
- Ko bunka zai no kagaku.  
See Sci. Pap. Japn. antiques
- Kodak Bull. Cur. Photo. Inf. Kodak bulletin. Current photographic information.
- Kōgyō kagaku zasshi.  
See J. Soc. Chem. Ind. Japn.

- Kokka Kokka; an illustrated monthly journal of fine and applied arts of Japan and other Eastern countries. Tokyo. 1889. Nos. 1-132 in Japanese; Nos. 133-181 have English title page with pls. accompanied by descriptive letterpress in English; Nos. 182-337 in English; Nos. 338- in Japanese with English summaries of important articles.
- Lack-u. Farben-Chem. Lack-und Farben-Chemie. Olten, Switzerland.
- Leica Photo. Leica photography. New York. 1933.
- Lib. Lit. Library literature; an author and subject index (with abstracts or digests for selected items) to books, periodicals, theses, and . . . librarianship. New York, H. W. Wilson Co. 1933.
- Life Life. Chicago. 1936.
- Lisboa. Instituto para a cultura. *See* Portugaliae physica
- Los Angeles Co. Mus. Q. Los Angeles County Museum quarterly. Los Angeles, Calif. 1941.
- Maandblad Beeldende Kunsten Maandblad voor Beeldende Kunsten. Vereeniging van Vrienden der Aziatische Kunst. Amsterdam. 1924.
- Mag. Art Magazine of art. American Federation of Arts. Washington, D. C. 1909.
- Magyar Kém. folyóirat Magyar kémiai folyóirat. Hungarian chemical journal. Budapest, Hungary. 1895. Formerly Magyar chemiai folyóirat.
- Magyar Mernok Építészegylet Közlönye Magyar Mernok és Építészegylet Közlönye. Journal of Hungarian Society of Engineering and Architecture. Suspended with vol. 78 (Dec. 1944).
- Mannus-bücherei (Leipzig) Mannus-bücherei. Reichsbund für deutsche Vorgeschichte. Leipzig. 1909-1942/44.
- Mech. Eng. Mechanical engineering. American Society of Mechanical Engineers. New York. 1906.



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| <p>Mededeel. Koninkl. Vlaam.<br/>Acad. Wetenschap. Belg.<br/>Kl. Wetenschap.</p> | <p>Mededeelingen van de Koninklijke Vlaamsche Academie voor Wetenschappen. Letteren en Schone Kunsten van Belgie. Klasse der Wetenschappen. Name changed with vol. 8, No. 7 (1946) to Mededeelingen van de Koninklijke Vlaamse Academie voor Wetenschappen. Letteren en Schone Kunsten, van Belgie. Brussels, Belgium.</p> |
| <p>Mededeel. Vlaam. Chem. Ver.</p>   | <p>Mededeelingen van de Vlaamse Chemische Vereniging. Formerly Mededeelingen van de Vlaamsche Chemische Vereniging. Printed in Flemish and French. Ghent, Belgium.</p>   |
| <p>Mell. Text.</p>   | <p>Melliand Textilberichte; Universelle Monatschrift für textile Forschung und Praxis. Heidelberg, Germany, 1920.</p>  |
| <p>Mém. acad. roy. belg. Classe<br/>beaux-arts</p>                               | <p>Mémoires de l'Académie royale de Belgique. Classe des beaux-arts. Brussels. 1915. Text in Flemish and French.</p>   |
| <p>Mem. mus. arqueol. prov.<br/>(Madrid)</p>                                     | <p>Memorias de los museos arqueológicos provinciales. Madrid.</p>  |
| <p>Mem. Soc. Amer. Archaeol.</p>   | <p>Memoirs of the Society for American Archaeology. Menasha, Wis. 1941.</p>  |
| <p>Mém. soc. belge géol. paléon-<br/>tologie hydrologie</p>                      | <p>Mémoires de la société belge de géologie de paléontologie et d'hydrologie. 1944.</p>  |
| <p>Mensch maatschappij</p>   | <p>Mensch en maatschappij. Nederlandsch nationaal bureau voor anthropologie. Amsterdam, 18 jaar, No. 1.</p>  |
| <p>Metal Finish.</p>   | <p>Metal finishing; devoted exclusively to metallic surface treatments. Westwood, N. J. 1903.</p>  |
| <p>Metal Progress</p>  | <p>Metal progress. American Society for Metals. Cleveland, Ohio. 1920.</p>   |
| <p>Metalloberfläche</p>  | <p>Metalloberfläche. Ausgabe A.; mit der Ausgabe B: Praxis der Galvanotechnik und verwandter Gebiete der Veredlung und des Schutzes der Metalloberfläche. Munich, Germany. 1946.</p>   |
| <p>Metallurgia</p>   | <p>Metallurgia; the British journal of metals. Manchester, England. 1929.</p>  |



- Metallurgia ital.      Metallurgia italiana. Revista dei metalli e delle loro applicazioni. Milan, Italy.
- Métaux et civil.      Métaux et civilisations. Les métaux dans l'histoire, les techniques, les arts. 1945. Discontinued with vol. 1, No. 6 (1946).
- Métaux et corrosion      Métaux et corrosion. Combined with Métaux et industries under new title: Métaux (Corrosion-Industries) beginning with vol. 26, No. 305 (Jan. 1951).
- Mikrochemie ver. Mikrochim. Acta      Mikrochemie vereinigt mit Mikrochimica Acta. Vienna, Austria. 1930. Printed in English, French, or German.
- Mineralog. (Portland, Oreg.)      Mineralogist; devoted to mineralogy, gem cutting, and the collector. Portland, Oreg. 1933.
- Mineralog. Mag.      Mineralogical magazine and journal of mineralogical society. Mineralogical abstracts. London. 1876.
- Minerva méd. legale      Minerva medicolegale. Turin. 1880.
- Mining J. (Phoenix, Ariz.)      Mining journal. Phoenix, Ariz. 1917.
- Mitt. Naturf. Ges. Bern      Mitteilungen der Naturforschenden Gesellschaft in Bern. 1843.
- M.J.      Museums journal. Museums Association. London. 1901.
- M.J. (Pakistan)      Museums journal. Pakistan. 1948?
- M.J. (Philadelphia)      Museums journal. University of Pennsylvania. Philadelphia, Pa. 1910.
- Mod. Packaging      Modern packaging. New York. 1927.
- Mod. Plastics      Modern plastics. New York. 1925.
- Mouseion      Mouseion. Bulletin de l'Office International des Musées. Discontinued with No. 56 (1946). Succeeded by Museum (Paris), UNESCO.
- Museum (Paris)      Museum. United Nations Educational, Scientific, and Cultural Organization. Paris. 1948. Text in English and French.
- Museum (Tokyo)      Museum; art magazine edited by the Japanese National Museum. Tokyo. 1951. Text in Japanese; title and contents page also in English.

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| Museum News  | Museum news. American Association of Museums. Washington, D. C. 1924.   |
| Namurcum (Belgique)                                | Namurcum. Société Archéologique de Namur. Namur, Belgium. 1924.   |
| Nat. Paint Bull.                                   | National paint bulletin. Discontinued with vol. 11, No. 2 (Feb. 1947).  |
| Nat. Paint, Varnish Lacquer Assoc. Sci. Sect. Cir. | National Paint, Varnish and Lacquer Association, Inc., Scientific section, Circulars. Continuation of American Paint and Varnish Manufacturers Association Scientific Section, Circulars. Washington, D. C. |
| Natural Hist.                                      | Natural history. American Museum of Natural History. New York. 1900.  |
| Nature (London)                                    | Nature. London. 1869.   |
| Nature (Paris)                                     | Nature; revue des sciences et de leurs applications. Paris. 1873.   |
| Natur. Rundschau                                   | Naturwissenschaftlichen Rundschau. Unter Mitarbeit zahlreicher Fachgelehrter. Stuttgart, Germany. 1948.   |
| Naturwissenschaften                                | Naturwissenschaften. Berlin. 1913.  |
| Natuurw. Tijdschr. (Belg.)                         | Natuurwetenschappelijk tijdschrift. Ghent, Belgium, 1914.   |
| Neues Jahr. Mineral.                               | Neues Jahrbuch für Mineralogie. Formerly Neues Jahrbuch für Mineralogie, Geologie und Paläontologie. Stuttgart, Germany. 1807.  |
| Nieuwsbull. Kon. Neder. Oud. Bond.                 | Nieuwsbulletin van de Koninklijke Nederlandse Oudheidkundige Bond. Leiden.  |
| Nihon bijutsu kōgei.<br>See Japn. Ind. art         |   |
| Nihon kagaku zasshi.<br>See J. Chem. Soc. Japn.    |   |
| Northwest Med.                                     | Northwest medicine. Oregon State Medical Society. Seattle, Wash. 1903.  |
| Nova Acta Leop.                                    | Nova Acta Leopoldina. Abhandlungen der Kaiserlich Leopoldinisch-carolinisch Deutschen Akademie der Naturforscher. Halle. 1933.  |
| Nucleonics   | Nucleonics. New York. 1946.   |
| Numismatic Rev.                                    | Numismatic review. New York. 1943.  |

Numismatist	Numismatist. American Numismatic Association. Washington, D. C. 1888.
O.A.	Oriental art; a quarterly journal devoted to the study of all forms of Oriental art. London. 1948. Discontinued with vol. 3 (1951).
Ochrona zabytków.	Ochrona zabytków. Krakow. 1948.
Österr. Z. Kunst Denk. (Vienna)	Österreichische Zeitschrift für Kunst und Denkmalpflege. Austrian journal for the preservation of art and monuments. Vienna. 1947.
Off. Dig.	Official digest. Federation of Paint and Varnish Production Clubs. Philadelphia, Pa. 1919.
Off. Tech. Ser. Repts.	Official technical service reports. U. S. Dept. of Commerce. Office of Technical Services. Washington, D. C.
Ohio J. Sci.	Ohio journal of science. Columbus, Ohio. 1900.
Oil and colour trades journal	Name changed with vol. 117 (Jan. 6, 1950) to Paint, oil and colour journal, which see.
Old-time New Eng.	Old-time New England; devoted to the ancient buildings, household furnishings, domestic arts, manners and customs, and minor antiquities of the New England people. Boston. 1910.
Olie (Holland)	Olie (Holland). No. 11 (1948).
Org. Finishing	Organic finishing; devoted exclusively to industrial coating. Westwood, N. J. 1939.
Oudheidkundig Jaar.	Oudheidkundig jaarboek. Nederlandsch Oudheidkundige Bond. Leiden. 1908. 1921 +. Oudheidkundig jaarboek bulletin van den Nederlandischen Oudheidkundige Bond. The Nieuwe bulletin is separately paged and bound at the end of each quarterly issue, 1948-.
Oud-Holland	Oud-Holland; driemaandelijks tijdschrift voor Nederlandse kunstgeschiedenis. Amsterdam, 1883. In Dutch with English summaries.

- Pacific Plastics Pacific plastics. Name changed with vol. 19 (May 1949) to Plastics Industry.
- Paint Mfg. Paint, incorporating paint manufacture. Formerly Paint, colour, oil, varnish, ink, lacquer manufacture. London. 1931.
- Paint, Oil, Chem. Rev. Paint, oil and chemical review. Formerly Paint, oil and drug review. Chicago. 1883.
- Paint Oil Col. J. Paint, oil and colour journal. Formerly Oil and colour trade journal. London. 1879.
- Paint Technol. Paint technology, incorporating Synthetic and applied finishes. Harrow, England. 1936.
- Paint Varnish Production Paint and varnish production, the technical magazine for manufacturers of paint, varnish, lacquer and other synthetic finishes. New York. 1910. Formerly Paint and varnish production manager.
- Palacio Palacio, El; a monthly review of the arts and sciences of the Southwest. Archaeological Society of New Mexico. Sante Fé, New Mexico. 1913.
- Pam. a muz. Pamiatkya a muzea. Slovensky pamiatovy ustav. Quarterly journal of the Slovak Institute for the Protection of Historical Monuments. Bratislava, 1952.
- Pap. Ind. Paper industry. Combined with Paper World in June 1938, under title Paper Industry and Paper World. Name changed back to Paper Industry with vol. 31, No. 10 (Jan. 1950). Chicago. 1919.
- Pap. Ind. and Pap. World.  
See Pap. Ind.
- Paper makers' association of Great Britain and Ireland. Name changed with vol. 31 (Feb. 1950) to British Paper and Board Makers' Association. Proceedings of the Technical Section, which see.
- Proceedings of the Technical Section
- Paper Trade J. Paper trade journal. Annual review and convention number. New York. 1872.
- Papers Robt. S. Peabody Found. Archaeol. Papers of the Robert S. Peabody foundation of archaeology. Phillips Academy. Andover, Mass. 1940.
- Pays Gaumais Pays Gaumais. Vol. 10 (1949).

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| Peintures, pigments, vernis<br>Penn. Univ. Mus. Bull. | Peintures, pigments, vernis. Paris. 1924.<br>Pennsylvania University. University museum<br>bulletin. Philadelphia. 1930.                                     |
| Pharm. Weekblad                                       | Pharmaceutisch Weekblad. Nederlandsch<br>maatschappij ter bevordering der phar-<br>macie. Amsterdam. 1864.   |
| Phoenix (Amsterdam)                                   | Phoenix; Maandschrift voor beeldende kunst.<br>Amsterdam. Jaarg. 1-4; maart 1946-dec.<br>1949.   |
| Pitture e vernici                                     | Pitture e vernici. Revista mensile tecnico-<br>economica del prodotti vernicianti e delle<br>materie prime. Milan, Italy. 1945.                              |
| Plastics (Chicago)                                    | Plastics. Chicago. 1944.   |
| Plastics (London)                                     | Plastics; dealing with the manufacture, uses,<br>and potentialities of plastic material. Lon-<br>don. 1937.  |
| Plastics and Resins                                   | Plastics and resins. New York. 1943.   |
| Plastics Dig.   | Plastics digest. Highland, N. J. Jan. 1942-<br>June 1943.  |
| Plastics Ind.   | Plastics industry; the production magazine of<br>the plastics industry. Formerly Pacific<br>plastics. New York. 1942.  |
| Plastics Monographs                                   | Plastics monographs. London. Institute of<br>the Plastics Industry.  |
| Plastics Reporter                                     | Plastics reporter. Boston. 1944.   |
| Plastics Trends                                       | Plastics trends. Los Angeles, Calif. 1941.   |
| Plastics World  | Plastics world; new materials, equipment,<br>applications. Greenwich, Conn. 1943.  |
| Pontif. Acad. Sci. Commenta-<br>tiones                | Pontificia Academia scientiarum. Commenta-<br>tiones. Vatican City, Rome, Italy. 1937.   |
| Porslin   | Porslin (AB Gustaveberge fabriker). 1951.  |
| Portugaliae physica                                   | Portugaliae physica. Instituto para a alta cul-<br>tura; Centro de estudos de fisca, Lisbon.<br>Universidade. Faculdade de ciencias. 1943.<br>In Portuguese. |
| P.P.S.  | Proceedings of the Prehistoric Society. Lon-<br>don. n.s., vol. 1 (1935).  |
| Pratk. Akad. Athenon                                  | Pratika tes Akademias Athenon. Printed in<br>Greek, French, or German. Athens, Greece.<br>Vol. 24 (1949) published in 1951.                                  |



- Prevention Prevention; devoted to the conservation of human health. Emmaus, Pa. 1950.
- Prevention Deter. Abs. Prevention of deterioration abstracts. Washington, D. C. Prevention of deterioration center; National Research Council, National Academy of Sciences. 1946. Supersedes Tropical deterioration bulletin.
- Print Print. Hartsdale, N. Y. June 1940. Absorbed the Printing Art, Summer 1942; the Print Collector's quarterly, Winter 1950/51.
- Print. Coll. Q. Print collector's quarterly. Kansas City, Mo. 1911. Absorbed by Print, Winter 1950/51, which see.
- Proc. Amer. Assoc. Mus. Proceedings of the American Association of Museums. Pittsburgh, Pa., etc., Washington, D. C. 1906/07.
- Proc. Amer. Phil. Soc. Proceedings of the American Philosophical Society. Philadelphia, Pa. 1938.
- Proc. Brit. Inst. Found. Proceedings of the British Institute of Foundrymen. London. 1898.
- Proc. Geol. Assoc. (Eng.) Proceedings of the Geologists' Association. London. 1859.
- Proc. Japn. Acad. Proceedings of the Japan Academy. Tokyo. Vol. 26 (1950). Formerly the Imperial Academy of Japan Proceedings.
- Proc. Phys. Soc. (London) Proceedings of the Physical Society. Sections A and B. London. 1874.
- Proc. Roy. Inst. Gt. Brit. Proceedings of the Royal Institution of Great Britain. London. 1851.
- Proc. Roy. Soc. London Proceedings of the Royal Society. Series A. Mathematical and physical sciences. London. 1665.
- Proc. Soc. Antiq. Scotland Proceedings of the Society of Antiquaries, Scotland. Edinburgh. 1851.
- Product Finishing (Brit.) Product finishing. London. 1948.
- Products Finishing (Amer.) Products finishing; cleaning, plating, polishing, finishing. Cincinnati, Ohio. 1936.
- P.Z. Praehistorische Zeitschrift. Berlin. 1909.



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| Quart. J. Geol. Mining Met.<br>Soc. India     | Quarterly journal of the Geological Mining and Metallurgical Society of India. Calcutta. 1926.   |
| Radex Rundschau                               | Radex Rundschau. Kärnten, Austria. 1952. Issued without a volume number.   |
| Rayon & Synthetic Textiles                    | Rayon and synthetic textiles. Formerly Rayon textile monthly. New York. 1925.  |
| Rec. Trav. Chim.                              | Recueil des travaux des chimiques des Pays-Bas. Nederlandse Chemische Vereniging. Amsterdam. 1882. Printed in English, French, or German.  |
| Rec. Trav. Protect. Mon. Hist.                | Recueil des travaux sur la protection des monuments historiques. Belgrad, Yugoslavia. Vol. 1, No. 1 (1950). For complete listing <i>see</i> Zbornik Savezni institut za zastitu spomenika kulture. |
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| Research (London)                             | Research; science and its application in industry. London. 1948.   |
| Rev. Archéol.                                 | Revue archéologique. Presses Universitaires de France. Paris. 1844.  |
| Rev. Arts                                     | Revue des arts; revue des arts et des musées. Conseil des Musées Nationaux. Paris. 1951.   |
| Rev. belge arch. hist. art                    | Revue belge d'archéologie et d'histoire de l'art. Académie Royale d'Archéologique de Belgique. Brussels. 1931.   |
| Rev. belge numismatique                       | Revue belge de numismatique et de sigilligraphie. Société Royale de Numismatique de Belgique. Brussels. 1842.  |
| Rev. gén. belge                               | Revue générale belge. Brussels. 1865.  |
| Rev. Inter. Police Crim.                      | Revue internationale de police criminelle. Commission Internationale de Police Criminelle. Paris. 1946. Editions in English and French.  |
| Rev. matériaux construction<br>et trav. publ. | Revue des matériaux de construction et de travaux publics. Edition C. Title varies slightly. Paris. 1905. Suspended publication in 1940. Resumed Jan. 1946.  |

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- Rev. mét.      Revue de métallurgie. Société d'Encouragement pour l'Industrie Nationale; Comité des Forges de France. Paris. 1904.
- Rev. Sci. Instr.      Review of scientific instruments with physics news and views. Lancaster, Pa. 1930.
- Rev. Univ. Bruxelles      Revue de l'Université de Bruxelles. 1950.
- Review      Review of current literature relating to the paint, colour, varnish and allied industries. Research Association of British Paint, Colour and Varnish Manufacturers. London. 1928.
- SAMAB      South African Museums Association. Bulletin. (Suid-Afrikaanse Museum-Associatie). Natal, S. Africa. 1936.
- Sbornik zachtite spomenika kulture. *See* Zbornik Zast. Spom. Kult.
- Schweizer archiv für Heraldik. *See* Arch. Hérald. Suisses
- Sci. Monthly      Scientific monthly. American Association for the Advancement of Science. Washington, D. C. 1915.
- Sci. Pap. Japn. Antiques      Scientific papers on Japanese antiques and art crafts. (Ko bunka zai no kagaku). Tokyo. 1951. Title page and contents also in English. Some English summaries.
- Science      Science. American Association for the Advancement of Science. Washington, D. C. 1880.
- Science Counselor      Science counselor; quarterly journal of methods and information for teachers of science. Pittsburgh, Pa. 1935.
- Science Prog.      Science progress; a quarterly review of scientific thought, work, and affairs. London. 1906.
- Science Tech. China      Science and technology in China. Institute of Chemistry. Academia Sinica. Shanghai, China. Apparently suspended with vol. 2, No. 5 (Oct. 1949) published in 1950.

- Seifen-Öle-Fette-Wächse      Seifen-Öle-Fette-Wächse; Fachblatt der Seifen-Öl-Harz-Wachs-Kosmetischen, Waschmittel-und Chem.-Techn. Industrie. Augsburg, Germany. 1874.
- Serigraph Quart.      Serigraph quarterly. National Serigraph Society. New York. Feb. 1946.
- Sheet Metal Ind.      Sheet metal industries. Industrial Newspapers Ltd. London. 1927.
- Sklářské rozhledy      Sklářské rozhledy. Výzkumný Sklářský Ústav. Králové, Czechoslovakia. 1923?
- Soap San. Chem.      Soap and sanitary chemicals. Formerly Soap. New York. 1925.
- South. Lumberman      Southern lumberman. Nashville, Tenn. 1881.
- Speculum      Speculum; a journal of mediaeval studies. Mediaeval Academy of America. Cambridge, Mass. 1925.
- Spectrochim. acta      Spectrochimica acta; commentarium scientificum internationale. Berlin. 1939. Text in English, French, or German.
- Stain Technol.      Stain technology; a journal of microtechnic and histochemistry. Biological Stain Commission. Geneva, N. Y. 1934.
- Streven (Amsterdam-Bruxelles)      Streven; algemeen cultureel tijdschrift. Amsterdam-Brussels. July 1947.
- Studies in conservation.  
See Conservation.
- Sudan Notes & Rec.      Sudan notes and records. Middle East Press. Khartoum, Egypt. 1918.
- Summa Brasil. Biol.      Summa Brasiliensis biologiae. Dept. de pesquisas e documentação da fundação Getúlio Vargas. Rio de Janeiro. 1945.
- Surveyor      Surveyor and municipal and county engineer. London. 1892.
- Tappi      Tappi. Technical Association of the Pulp and Paper Industry. New York. 1918?
- Taxandria (Belgie)      Taxandria (Belgie). Vol. 16 (1951).
- Tech. et Civil.      Techniques et civilisations. Saint-Germain-en-Laye. (S.-et-O.), France. 1950.
- Tech. Mitt. Malerei      Technische Mitteilungen für Malerei. Apparently discontinued with Jahr. 57 (Dec. 1941).

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| Tech. Wetenschap. Tijds.   | Technisch-wetenschappelijk tijdschrift; orgaan van de vlaamse ingenieursvereniging. Antwerp, Belgium. 1937.  |
| Technicka (Budapest)   | Technicka, journal of technical sciences. Budapest, Hungary. Suspended with vol. 25, No. 9 (1944).   |
| Teintex  | Teintex; revue générale des matières colorantes. Paris. 1936.  |
| Természettud. Közlöny  | Természettudományi Közlöny. Journal of natural history. Discontinued with vol. 76 (Dec. 1944). Resumed publication as Természettudomány (Natural history) with vol. 1, No. 1 (1946). |
| Textil-Praxis  | Textil-Praxis; Berichte aus Betrieb und Forschung für Spinnerei, Weberei, Strickerei, Wirkerei, Flechtere, Bleicherei, Fäberei, Druckerei und Veredlung. Stuttgart S, Germany. 1946. |
| Textile Res. J.  | Textile research journal. Textile Research Institute, Inc. New York. 1930.   |
| Tijdspiegel  | Tijdspiegel; cultureel maandblad voor Limburg, onder de bescherming van de Provinciale Overheid. Hasselt, Belgium, 1946.   |
| Trans. Amer. Geophys. Union  | Transactions of the American Geophysical Union. Washington, D. C. 1919.  |
| Trans. Amer. Soc. Mech. Eng.   | Transactions of the American society of mechanical engineers. American Society of Mechanical Engineers. New York. 1880.  |
| Trans. Brit. Ceram. Soc.   | Transactions of the British Ceramic Society. Stoke-on-Trent, England, 1901.  |
| Trans. Canad. Min. Inst.<br>(Inst. Min. Metall.)                                   | Transactions of the Canadian Mining Institute. (Canadian Institute of Mining and (Metallurgy.) Ottawa. 1912.   |
| Trans. Chalmers University<br>of Technology.<br>See Chalmers Tek. Högsk.<br>Handl. |  |
| Trans. Faraday Soc.  | Transactions of the Faraday Society. To promote the study of sciences lying between chemistry, physics, and biology. London. 1903.   |

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| Trans. Hon. Soc. Cymm-<br>rodorion                                       | Transactions of the Honorable Society of<br>Cymmrodorion. London. 1892/93.   |
| Trans. Inst. Plastics Ind.   | Transactions of the Institute of Plastics In-<br>dustry. London. Vol. 1-19 (Jan. 1932-<br>Oct. 1952).  |
| Trans. Newcomen Soc.   | Transactions of the Newcomen Society for<br>the Study of the History of Engineering<br>and Technology. London. 1920/21.  |
| T.O.C.S.   | Transactions of the Oriental Ceramic Society.<br>London. 1921/22.  |
| Trans. Roy. Soc. S. Australia  | Transactions of the Royal Society of South<br>Australia. Adelaide, S. Australia. 1877.   |
| Trav. Peinture   | Travaux de peinture; revue technique et pro-<br>fessionnelle. Union Nationale des Pein-<br>tures-vitriers de France. Paris. 1946.  |
| Trop. Woods  | Tropical woods. Yale University. School<br>of Forestry. New Haven, Conn. 1925.   |
| Ulster J. Ant.   | Ulster journal of antiquaries.   |
| Univ. Calif. Los Angeles.<br>Pub. Biol. Sci.                             | University of California at Los Angeles.<br>Publications in biological science. 1933.  |
| U.S.D.A. Misc. Pub.  | U. S. Dept. of Agriculture. Miscellaneous<br>publications. Washington, D. C.   |
| U.S.D.A. Tech. Bull.   | U. S. Dept. of Agriculture. Technical bulle-<br>tin. Washington, D. C.   |
| U. S. Quart. Bk. Rev.  | U. S. Quarterly book review. Library of Con-<br>gress. New Brunswick, N. J. 1945.  |
| Valeurs  | Valeurs; revue de critique et de literature.<br>Alexandrie. 1945.  |
| Verfkroniek  | Verfkroniek; official orgaan van de Verenig-<br>ing van Vernis-en Verffabrikanten in Ne-<br>derland. Amsterdam. 1928?  |
| Verhandel. Koninkl. Vlaam.<br>Acad. Wetenschap. Belg.<br>Kl. Wetenschap. | Verhandelingen van de Koninklijke Vlaam-<br>sche Academie voor Wetenschappen, Let-<br>teren en Schoone Kunsten von Belgie.<br>Klasse der Wetenschappen. Brussels. 1939.<br>In Dutch with French and German ré-<br>sumés. |
| W.A.M. News Bull &<br>Calendar   | Worcester Art Museum news bulletin and<br>calendar. Worcester, Mass. 1935.   |
| Workshop Notes Pap.  | Workshop notes. Papers. Textile Museum.<br>Washington, D. C. 1950.   |

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| Zavodskaya Lab.             | Zavodskaya laboratory. Moscow. 1935.  |
| Zbornik Zast. Spom. Kult.   | Zbornik Savezni institut za zastitu spomenika kulture. Selection of papers on the protection of historic monuments. Belgrad, vol. 1 (1950). (Belgrade, Yugoslavia, 1951). In Serbian-Croatian with résumés in French.   |
| Z. Kunst.                   | Zeitschrift für Kunstgeschichte. München-Berlin. 1932.  |
| Zhur. Fiz. Khimii           | Zhurnal Fizicheskoi Khimii. Journal of physical chemistry, Izdatel'stvo Akademii Nauk. S.S.S.R. Moscow. 1926.   |
| Z. Schweiz. Arch. u. Kunst. | Zeitschrift für schweizerische Archäologie und Kunstgeschichte. Verband der schweizerischen Altertumssammlungen; Gesellschaft für schweizerische Kunstgeschichte. Zurich, Switzerland. 1939. Text in French and German. |



## GENERAL LITERATURE

1. ABRAMS, EDWARD. *Microbiological deterioration of organic materials; its prevention and methods of test*. Washington, D. C., Govt. print. off., 1948. 41 pp., illus. (National bureau of standards. Misc. pub. 188).

Contents: Pt. 1. Review of the literature: Preface; Introduction; Microbiology; Enzyme action; Organic materials utilized by microorganisms; Prevention of deterioration; Testing for fungicidal efficiency. Pt. 2. Investigation of microbiological tests: Development of mildew testing at Bureau; Representative problems; Test methods; Experimental results and discussion; Summary and conclusions; References. BMU

2. BRANDI, CESARE. Il ristabilimento dell'unità potenziale dell'opera d'arte. *Boll. ist. centrale restauro*, 2 (1950), pp. 3-9.

Importance de "l'unité potentielle" des oeuvres d'art en matière de restauration. PC

3. CAGIANO DE AZEVEDO, MICHELANGELO. Conservazione e restauro presso i Greci et i Romani. *Boll. ist. centrale restauro*, 9-10 (1952), pp. 53-60.

Problèmes de conservation et de restauration chez les Grecs et les Romains. Référence aux sources littéraires. PC

4. CALEY, EARLE R. Early history and literature of archaeological chemistry. *J. Chem. Educ.*, 28 (1951), pp. 64-66; *C.A.*, 45 (1951), 4975f.

In a study of the pioneer work of Klapproth and of Pearson nearly 100 publications prior to 1875 have been located. In addition to being of historical value, many of these early papers provide data that are still useful. Thirty references are listed.

5. CALEY, EARLE R. Klapproth as a pioneer in the chemical investigation of antiquities. *J. Chem. Educ.*, 26 (1949), pp. 242-248, tables.

Klapproth's (1743-1817) analytical methods are critically reviewed. Many of his analyses are given. In addition to pioneering in the analysis of Greek and Roman antiquities, he was the first to analyze an object from the Far East. RJG

6. Centre national de recherches 'Primitifs flamands'. *Les primitifs flamands*. I, Corpus de la peinture des anciens Pays-Bas méridionaux au quinzième siècle. Fasc. 1 à 4: Le Musée Communal de Bruges par A. Janssens de Bisthoven et R. A. Parmentier. Anvers, De Sik-

kel, 1951. 73 pp., 231 pl. Fasc. 5: La Galerie Sabauda de Turin par C. Aru et Et. de Geradon. Anvers, De Sikkel, 1952. 35 pp., 69 pl.

Les données de l'histoire et de l'histoire de l'art sont complétées par une "description matérielle" des tableaux étudiés (15 pour Bruges, 5 pour Turin). Celle-ci comprend des caractéristiques d'ordre technique sur la couche protectrice, la couche picturale, la préparation, le support, et le cadre. PC

7. Condition of pictures in Italy. *Burl. Mag.*, 85 (1944), pp. 258-260.

An account of the whereabouts and condition of a number of paintings in Italy based on a War Office Report. Includes a list of works stated to be missing from the Naples Gallery. SRJ

8. COREMANS, PAUL B. A. Lucas. *C.E.*, 22 (1947), pp. 301-304.

The main publications of A. Lucas are given. PC

9. FORBES, EDWARD W. Arthur Pillans Laurie—Obituary. *College Art J.* 9 (1949-50), pp. 206-207.

10. FORBES, ROBERT JAMES. *Ambacht en wetenschap in het Oude Nabije Oosten*, Rede gehouden ter aanvaarding van het ambt van bijzonder hoogleeraar aan de Universiteit te Amsterdam op 30 juni 1947. Leiden, E. J. Brill, 1947. 46 pp. BMU

11. FORBES, ROBERT JAMES. *Bibliographia antiqua; philosophia naturalis*. Leiden, Nederlands Instituut voor het Nabije Oosten, 1940-52. 10 pts. in 5.

Recueil de 13,240 références bibliographiques (jusqu'en 1950) sur la civilisation ancienne. I. Mines et géologie, 612 réf.; II. Métallurgie, 3517 réf.; III. Matériaux de construction, 292 réf.; IV. Poterie, verre, etc., 471 réf.; V. Peintures, vernis, encres, etc., 260 réf.; VI. Cuir, 37 réf.; VII. Matériaux fibreux, 307 réf.; VIII. Papier, papyrus, etc., 96 réf.; IX. L'Homme et la nature, 2,330 réf.; X. Science et technologie, 2,778 réf.; Supplément I, 2,488 réf. RL

12. FORBES, ROBERT JAMES. *Cultuurgeschiedenis van wetenschap en techniek*. Den Haag, Success, 1948. 502 pp., 105 illus. (Universiteit voor Zelfstudie).

Tables des matières: Invention et découverte; L'ère de la pierre; Le proche orient ancien; Les classiques, Grèce et Rome; Byzance et les Arabes; Le Moyen-Age; Les XVI et XVII<sup>e</sup> siècles; Le XVIII<sup>e</sup> siècle; Les XIX et XX<sup>e</sup> siècles. Bibliographie. RL

13. FORBES, ROBERT JAMES. *Man the maker: a history of technology and engineering*. New York, Schuman, 1950. 355 pp., illus.

Contents: Man and nature; The dawn of history (before 3000 B. C.); The Great empires of the ancient Near East (3000-600 B. C.);

Greeks and Romans (600 B. C.—A. D. 400); Wardens of the classical heritage; Technology and theology (A. D. 400-1500); New wine into old bottles (1500-1750); Steam comes of age (1750-1830); The conquest of distance (1750-1930); Steel and electricity (1830-1930). Epilogue: Technology and progress; Bibliography; Index.

Reviewed in: *Chem. Eng. News*, 29 (Je. 11, 1951), p. 2424. BMU

14. FORBES, ROBERT JAMES. *Wetenschap en Techniek in de Oudheid*. Den Haag, N.V. Servire, 1945. 122 pp., 16 illus.

Table des matières: Le plus lointain passé; Le monde d'Égypte et de Mésopotamie; La science magique et ses centres; La science logique et l'hellénisme; L'ancienne technique reste florissante; Épilogue du combat; Bibliographie. RL

15. FRIEDLÄNDER, MAX J. *On art and connoisseurship*, 4th ed. Oxford, Bruno Cassirer, 1946. 284 pp., 40 pls. (incl. front.).

Contents: Introduction; Preface; Seeing, perceiving, pleasurable contemplation; Existence, appearance, objective interest in things; Art and symbol; Form, color, tonality, light, gold; The concept of "Pictorial"; Size and scale, distant view, and near view; On linear perspective; Movement; Truth to nature, artistic value, and style; Individuality and type; On beauty; On composition; On the picture categories; Religions and secular history in painting; the nude; "Genre" painting; Landscape; Portraiture; Still life; The artist: genius and talent; Art and erudition; The standpoint of the spectator; On the value of the determination of authorship; On the objective criteria of authorship; On intuition and the first impression; Problems of connoisseurship; The analytical examination of pictures; On the use of photography; On personality and its development; On the anonymous Masters, the medium Masters and the lesser Masters; The study of drawings; Influence; Artistic quality: original and copy; Deductions "a posteriori" from copies regarding lost original; Workshop production; On forgeries; On restorations; On art literature; Index. PC

16. HEDVALL, JOHAN ARVID. Objects of cultural value and knowledge of materials. *Museum (Paris)* 5 (1952), pp. 39-52, illus.

A discussion of the structure and causes of deterioration in objects and monuments of stone, glass, bronze, tin, etc. NLB

17. JOURDAIN, MARGARET, and JENYNS, R. SOAME. *Chinese export art in the eighteenth century*. London, Country life limited; New York, Charles Scribner's sons, 1950. 152 pp., illus.

Contents: List of illustrations; Introduction; Lacquer and lacquered furniture; Paper-hangings, prints, and paintings; Paintings on glass; Porcelain; Painted (Canton) enamels; Carving in ivory, tortoise shell, and mother-of-pearl; Silk textiles; Appendices; Index; Bibliographical footnotes.

Reviewed in: *Connoisseur*, 129 (April 1952), p. 57, by J. F. Hayward; *Artibus Asiae*, 15 (1952), pp. 283-284, by Elizabeth Lyons.

BMU

18. KLOKOC, O. Restoration of art objects in museums. *Pam. a muz.*, 1, no. 3 (1952), p. 18.
19. LI CH'IAO-P'ING. *The chemical arts of old China*. Easton, Pa., Journal of chemical education, c1948. 215 pp., illus.  
 Contents: Foreword, by Tenney L. Davis; Preface; Introduction; Alchemy; Metals; Salt; Ceramic industries; Lacquer and lacquering; Gunpowder; Colors and dyes (Chinese ink—Colors—Chinese stamp ink or *Yin-se*); Vegetable oils and fats; Incense, essential oils, and cosmetics; Sugars; Paper; Leather and glue; Soybean products; Alcoholic beverages and vinegar; Appendices.  
 Reviewed in: *O. A.*, 2 (1949/50), pp. 126–128, by William Willetts.  
 BMU
20. LUCAS, ALFRED. *Ancient Egyptian materials and industries*. 3d ed. London, Edward Arnold & co., c1948. 520 pp., tables.  
 Contents: Introduction; Adhesives; Alcoholic beverages; Animal products; Beads; Building materials; Cosmetics, perfumes, incense, and fragrant woods; Inlaid eyes; Fibres, woven fabrics, dyeing; Glazed ware; Glass and glass manufacture; Metals and alloys, ores, metal-working; Mummification; Oils, fats, and waxes; Painting materials, writing materials; Pottery and pottery-making; Stones, precious and semiprecious; Stones, other than building stones and precious stones—stone vessels; Wood and woodworking, bark, silicified wood, charcoal; Historical summary; Chemical analyses; Index.  
 Reviewed in: *Nature*, 162 (1948), p. 429, by M. C. Burkitt. RMO
21. MARCONI, B. Aesthetics and ethics in the conservation of art objects; polychrome painting and sculpture. *Pam. a muz.*, 1, no. 3 (1952), pp. 25–28. (Translated from the Polish.)
22. MICHEL, ÉDOUARD. *La vie dans les musées I. Au musées du Louvre I. Le service d'étude et de documentation du département des peintures*. Bruxelles, Office de publicité, 1947. 10 pp.  
 The purpose of the 'Service' is to gather and study all available records, both written and photographic, connected with all the Louvre paintings and thus complete in an interesting way the normal inventory notes. Up to now all the information gathered on Jordaens' "Quatre Évangélistes," and Watteau's "L'Embarquement pour l'île de Cythère" has been published with many illustrations. PC
23. NORRIS, CHRISTOPHER. The disaster at Flakturm, Friedrichshain; a chronicle and list of paintings. *Burl. Mag.*, 94 (1952), pp. 337–352.  
 A list with 56 illustrations of paintings from the Kaiser-Friedrich-Museum believed to have been in the shelter on the eve of the fire which destroyed them. SRJ



24. *Ochrona zabytków*. (Zarząd Ochrony i Konserwacji Zabytków Ministerstwa Kultury i Sztuki i Stowarzyszenie Historyków Sztuki). Quarterly on the protection and conservation of architectural monuments issued by the Board for the Protection and Conservation of Monuments of the Ministry of Culture and Arts and the Association of Art Historians. Warsaw, 1948. Recurrent feature: Brief notes.
25. O'DWYER, JOHN, and LE MAGE, RAYMOND. *A glossary of art terms*. London, New York, Peter Nevill Ltd., 1950. 148 pp.

A book for those not familiar with proper names and terms used in connection with the description of works of art. BMU

26. OGDEN, HENRY V. S., and MARGARET S. A bibliography of seventeenth century writings on the pictorial arts in English. *Art Bull.*, 29 (1947), pp. 196-201.

This bibliography includes works on painting and the graphic arts, theoretical, historical, and technical. They are listed in three groups: (1) Anonymous printed books, (2) printed books by known authors, and (3) manuscripts, arranged according to the libraries where they may be found. EHJ

27. ORMSBEE, THOMAS HAMILTON. *Care and repair of antiques*. New York, Medill McBride company, 1949. 168 pp., illus.

Contents: Foreword; The look of the antique; Where to find antiques; How to judge antique furniture; Old silver and its imitations; Antique porcelain and earthenware; American glass, pressed and blown; Pewter, brass, and copper; Prints of varied types and kinds; Refinishing antique furniture; Making drawers track and beds usable; Fixing tables and chairs; Proper hardware for antique furniture; Remedies for ailing and damaged glass; Care and treatment of old prints; Care of pewter, silver, and china.

Reviewed in: *Antiques*, 59 (Mar. 1951), p. 180.

BMU

28. *Österreichische Zeitschrift für Kunst und Denkmalpflege* (Austrian journal for preservation of art and monuments), Jahr. 1, 1947+. Vienna, Anton Schroll & co. Bimonthly. Editor: Otto Demus. Jahr. 1-5; 1947-1951 published under title: *Österreichische Zeitschrift für Denkmalpflege*.

Contains numerous articles on the preservation of buildings and monuments, especially the problems of conservation arising from the destruction in World War II. RJG

29. *Pamiatkya a muzea*. (Slovensky pamiatovy ustav). Quarterly journal issued by the Slovak Institute for the Protection of Historical Monuments. Bratislava, Czechoslovakia. Vol. 1, no. 1, 1952. Recurrent features: Bibliography; News.

30. PARTINGTON, J. R. History of alchemy and early chemistry. *Nature (London)*, 159 (1947), pp. 81-85.

Traces the development of ideas concerning the nature of matter and materials, with particular reference to Western alchemy originating in the Near East at the beginning of the Christian Era, and mentions the working notes of early forgers (A. D. 300), Paris alchemists in the early thirteenth century, and the imitation of lapis lazuli by blue glass colored with cobalt described on Assyrian tablets of 650 B.C.

LB

31. PLENDERLEITH, HAROLD JAMES. Preservation of museum specimens. *Thorpe's dictionary of applied chemistry*. 4th ed., vol. 8 (1947), pp. 247-252.

Aims of treatment are defined and correlated with optimum museum conditions which are specified. Material from excavations is discussed in some detail under the two main headings of (a) Stone and other porous material, and (b) Metals, where the various forms of treatment of copper and its alloys, silver, iron and lead are concisely tabulated according to the condition of the find. The subsequent conservation of specimens resolves itself into protection from dust, mould and insects, and various methods suitable under different conditions are outlined. A knowledge of the nature of the chemicals and processes involved is assumed, and the necessity for expert advice on the treatment of works of art is stressed.

LB

32. POPE, ARTHUR. *The language of drawing and painting*. Cambridge, Mass., Harvard university press, 1949. 162 pp., 71 numb. plates (part col.). First issued 1931.

Contents: Preface; Pt. I. The terms of drawing and painting; Pt. II. Mode of presentation; Appendix; Bibliographical note; Plates. BMU

33. RAWLINS, FRANCIS IAN GREGORY. Arthur Pillans Laurie, 1861-1949—Obituary. *J. Chem. Soc.* (Jan. 1950), pp. 429-430.

34. Repair and restoration of antiques. *Antiques*, 59 (1951), pp. 180, 182, 184, 186, 188 and pp. 428, 430, 432, 434, 436.

These articles in the Shop Talk column review very briefly the types of repairs that can be made to glass, paintings, rugs, furniture, etc., and mention one firm for each type of repair. Very few details of materials and techniques used are given.

EHJ

35. ROBINSON, DAVID M. Bibliography of archaeological books—1946. *Amer. J. Archaeol.*, 2s. 51 (1947), pp. 211-217.

Contents: General and miscellaneous; Near East; Egypt; Pre-Hellenic; Greek; Greek and Roman; Roman; Byzantine and Western Medieval; Modern Greek; Later art.

RJG

- 35a. *Scientific papers on Japanese antiques and art crafts*. (Ko bunka zai no kagaku.) Tokyo, Association of Scientific Research of Antiques.



No. 1, January 1951. Title-page and contents also in English. Some English summaries.

The association was founded for artistic research with representation from the disciplines by Taki Seiichi in 1933. Offices are maintained at the National Museum, Tokyo, and the papers disseminate the findings of the association on the dating, authenticity, preservation and technology of art objects, which include sculpture, paintings, and crafts. HPS

36. *Studies in conservation*, v. 1, no. 1, Oct. 1952+. Journal of the International Institute for the Conservation of Museum Objects. Edinburgh, Thomas Nelson and sons Ltd. Biannual. Editor: F. I. G. Rawlins.

Original articles that are concerned with the theory and practice of conservation in art and archaeology. RJG

37. TESTI, GINO. *Dizionario di alchimia e di chimica antiquaria*. Roma, Casa editone Mediterranea, 1950. 201 pp., illus.

Résumé dans: *Boll. ist. patologia libro*, 8(1949), p. 125.

38. United nations educational scientific and cultural organization. *International directory of photographic archives of works of art*. Paris, Dunod, 1950. 667 pp.

The directory contains an introduction by Sir Leigh Ashton, an explanatory note, 654 pages of listings, a methodical table of contents, a list of countries, an index, and the text in both English and French.

BMU

39. U. S. National gallery of art. Index of American design. *Arts and crafts; a bibliography for craftsmen*. Washington, D. C., The Museum, c1949. 80 pp.

"This annotated bibliography, covering several of the handicrafts, was prepared by the National Gallery of Art, Index of American Design, in cooperation with the Division of Vocational Education, Office of Education, Federal Security Agency. It is not in any sense a complete listing of books on any one subject, but includes publications in a number of craft fields which give information on the making as well as the designing of craft products . . ."—Foreword. BMU

40. U. S. National park service. *Field manual for museums*, by Ned J. Burns. Washington, D. C., U. S. Govt. print. off., 1941. 426 pp. incl. front., illus.

Contents include: Ch. VII. Technical methods. This chapter describes the technique of cleaning and preserving museum objects . . . Ch. IX. Historic house museums. Discusses protection of these museums. Bibliography. Index. BMU

41. WEINBERGER, MARTIN. A sixteenth century restorer. *Art Bull.*, 27 (1945), pp. 266-269.

The author attributes on stylistic grounds the restorations of the Metropolitan Museum's "Dying Meleager," Roman, Second Century A. D., to Valerio Cioli, born in Settignano in 1529. Cioli, a pupil of Niccolo Tribolo, is known to have worked at the restoration of ancient sculpture in Rome in the 1550's and in Florence for Cosimo I from 1561. He was the sculptor of various figures in the Boboli gardens. Vasari mentioned Cioli and Montorsoli as restorers of ancient sculpture but neglected to mention the third eminent restorer Giovanantonio Dosio. EHJ

42. *Zbornik Savezni institut za zastitu spomenika kulture*. (Selection of papers on the protection of historic monuments, Belgrad), Vol. 1, no. 1, 1950 (Belgrade, 1951). *ICOM news*, 6 (Fevrier, 1953), p. 26.

This publication contains a number of articles concerning museum laboratories. Written in Serbian or Croatian, they are followed by short résumés in French. The main subjects are: Conditions and problems of the Historic Monuments Department in Yugoslavia; Basic principles in restoration; Views on the protection and conservation of archeological sites and monuments; Conservation of fortified castles; Problems of conservation for ethnographical material; Conservation of museum objects; Cleaning and restoration of frescoes, icons, paintings, monuments, etc.; organization of the Historic Monuments Service in Croatia, Bosnia, Herzegovinia, Macedonia, Serbia, and Montenegro.

## MUSEOLOGY

### A. INSTITUTIONAL ESTABLISHMENTS

43. Association of British picture restorers. *Apollo (London)*, 40 (1944), p. 29.

Announcement of the formation of the association. Membership is restricted to British-born subjects. RJG

44. Association of British picture restorers. *Fourth report, 1951*. London, 1952. 9 pp.

Lists the patrons and trustees, officers, activities of the association, and financial reports for the year. BMU

45. BIEK, LEO. The Ancient Monuments laboratory. *M. J.*, 51 (1952), pp. 291-293.

The A. M. laboratory of the Ministry of Works in London is staffed by a scientist and three technical assistants who work in small but well-fitted quarters in Lambeth Bridge House. Much of the laboratory time is spent on research connected with the repair of ancient monuments and historic buildings. Examples are given of many interesting problems that arise in the preservation of objects and artifacts found in archaeological excavations about the monuments. RJG

46. Conservation of museum objects. *Endeavour*, 9 (1950), pp. 163-164.

An announcement of the founding of the International Institute for the Conservation of Museum Objects with aims and purposes. Previous work in the field of art conservation is reviewed. RJG

47. Coordinamento dei servizi di restauro. *Boll. ist. patologia libro*, 5 (Oct./Dec. 1946), pp. 121-123; *Lib. Lit.*, (1946-48), p. 55.

The Institute of Book Pathology has been designated by the Ministry of Public Instruction to coordinate the work of the various libraries in Italy in repairing and restoring books and manuscripts. It here reprints the letter sent to the libraries giving the general principles of restoration work and asking for information on their restoration services.

48. COREMANS, PAUL B. L'activité du Laboratoire de recherches physico-chimiques des Musées Royaux d'Art et d'Histoire de Bruxelles pendant la guerre. *Museumion*, 55-56 (1946), pp. 55-59.

Aperçu de l'activité scientifique du laboratoire, avec mention des publications parues à ce sujet. Transposition de peintures murales, analyse de leurs liants et pigments; examen scientifique et conservation d'une châsse en argent doré. PC

49. FELL, H. GRANVILLE. The Association of British Picture Restorers. *Connoisseur*, 113 (1944), p. 127.

Editorial reference to the announcement of the foundation of the Association of British Picture Restorers. SRJ

50. GEDYE, IONE. Training museum technicians. *M. J.*, 49 (1950), pp. 240-242.

Describes the one-year course offered at the Institute of Archaeology, London. The practical side includes: Cleaning, mending, and restoration of pottery and bones and other materials; casting, modeling, and dioramas; drawing of archaeological objects; museum case fitting, layout and labeling; photography and survey. There are lectures and demonstrations on various subjects. RJG

51. GSPAN, ALFONZ. Les maladies des imprimés et des manuscrits et leur traitement. *Rec. Trav. Protect. d'Mon. Hist.* 2, cahier 1 (1951), pp. 87-94.

Description de l'organisation et du fonctionnement de l'Institut de Pathologie du Livre à Rome, avec bibliographie des articles parus dans le *Boll. ist. patologia libro*. RL

52. HOURS, MAGDELEINE. Nouveaux matériels et procédés au Laboratoire du Musée du Louvre. *Boll. ist. centrale restauro*, 3-4 (1950), pp. 65-69, 2 illus., 1 pl.

Appareillage scientifique et méthodes utilisées. PC

53. International council of museums. Biennial conference, 2nd. London, 1950. Second biennial conference. *ICOM news*, 3 (Aug. 1950), pp. 1-6 (in French); pp. 14-19 (English).

Among the resolutions adopted are those that relate to (1) exchange of restorers and (2) care of paintings. RJG

54. International institute for the conservation of museum objects. *Nature (London)*, 165 (1950), pp. 903-904.

The incorporation as a company under English law by the Board of Trade of the International Institute for the Conservation of Museum Objects is announced. "It is a professional body formed for the purpose of setting and maintaining a high standard of skill and competence in the conservation of all kinds of valuable material and artistic patrimony." The problem of conservation of museum objects, the need for scientifically trained personnel and a need for adequate standards of attainment are discussed.

The Institute is to have its headquarters in London. The members will be of two grades; fellows and associates (with the rank of honorary fellow available for persons of outstanding distinction). The Institute proposes to foster publication, to encourage training in the theory and practice of conservation, and to cooperate with other institutions with related interests. RJG

55. International institute for the conservation of museum objects. *Handbook and regulations concerning membership*. London, 1951. 7 pp. RJG

56. Oberlin college. Allen memorial art museum. Intermuseum laboratory. *Its Bulletin*, 10 (Fall 1952), pp. 29-31.

A brief account of the founding of the Intermuseum Conservation Association under the joint sponsorship of the Albright Gallery, Buffalo; Columbus, Ohio, Gallery of Fine Art; Allen Memorial Art Museum, Oberlin; The John Herron Art Institute, Indianapolis; The Toledo, Ohio, Museum of Art; and the Davenport, Iowa, Municipal Art Gallery. The project (1) embraces the idea of conservation, a long-term plan for the maintenance of the structure and artistic integrity of museum objects, and (2) provides these services as a professional rather than a commercial enterprise. The laboratory at Oberlin, which is under the direction of Richard D. Buck, has been equipped with X-ray, microscopes, and other tools necessary for the examination of works of art. RJG



57. RAWLINS, FRANCIS IAN GREGORY, and WERNER, A. E. A. The scientific department of the National Gallery. *Nature (London)*, 164 (1949), p. 601.

The physics laboratory has been operating since 1934. It concerns itself with technical examination of paintings chiefly by means of X-radiography, colorimetry, and infrared photography. More recently a chemical laboratory has been established in which problems relating to the cleaning of paintings are studied. These include investigation of organic solvents suitable for use in cleaning operations, preparation of cross sections of paint specimens, identification of pigments and mediums, relining adhesives, surface coatings, and moisture barriers. Although much of the effort is directed to the solving of immediate problems some attention is given to the philosophical and methodological aspects of an objective approach to cultural matters.      RJG

58. REMIZOVA, P. Laboratoriâ po gîgiene knigi. (Book hygiene laboratory.) *Bibliotekar'*, no. 9 (Dec. 1948), pp. 36-39; *Lib. Lit.* (1946-48), p. 55.

The Lenin State Library in Moscow has carried on book conservation and restoration for over 10 years. Chemical and entomological laboratory workers study the causes of book destruction and learn thereby what conditions are best for book storage. The laboratory gives scientific counsel to other libraries.

59. Rome (City) Institut de pathologie du livre. *l'Institut de pathologie du livre à Rome*. Roma, 1952. 35 pp., illus.

Contents: Organisation; I. Le Musée—la Bibliothèque—la Photothèque—le Laboratoire de restauration; II. La Biologie—l'Entomologie—la Microbiologie (Mycologie et Bactériologie); III. La Chimie—la Laboratoire de chimie—la Chambre d'isolement et de désinfection; IV. La Physique—le Laboratoire d'optique physique—le Laboratoire de technologie; V. La Technologie—le Laboratoire de technologie—le Laboratoire de chalcographie—la Fabrique de papier.      BMU

60. Rome (City) Istituto di patologia del libro. *Istituto di patologia del libro à Roma*, by C. Cappotto, Roma, IRCE, 1948. 32 pp., 12 illus.

Brochure contenant une description de l'organisation et du fonctionnement.      RL

61. SALIN, ÉDOUARD, and FRANCE-LANORD, ALBERT. A laboratory for archaeological research. *Museum (Paris)*, 4 (1951), pp. 187-193, illus.

The archaeological research laboratory established in 1950 in the Musée historique of Nancy has two purposes: to revive early craft techniques and to restore and preserve objects. Examination and treatment is described of objects including a 6th century vase and a Merovingian damascened sword.      NLB

62. SHIBATA YUJI 柴田雄次. Glimpses of the scientific research institutes for the restoration of antique art in France and Italy. *Sci. Pap. Jap. Antiques*, no. 2 (Oct. 1951), pp. 1-3.

Activities of Institut Mainini of the Louvre, Paris, and Istituto Centrale del Restauro, Rome, are described. KY

63. SHIBATA YUJI 柴田雄次. Outline of the Association of Scientific Research of Antiques in Japan. *Sci. Pap. Jap. Antiques*, no. 1 (Jan. 1951), pp. 1-3.

The association was founded in 1933 by the late Dr. Seiichi Taki. It was reorganized in 1947 by the late Dr. Keita Shibata. KY

64. South African commission for the preservation of natural and historical monuments, relics and antiquities. *Report of the commission . . . for the period 1st April, 1949 to 31st March, 1950*. 10 pp. (Annual report, no. 15.) Text in English and Dutch.

BMU

65. TUCEK, K., and MARKU, M. The Congress of Czech museologists in Ceske Budejovice. *Pam. a muz.*, 1, no. 3 (1952), p. 38.

66. United nations educational scientific and cultural organization. *Conférence générale. 5<sup>ème</sup> session, Florence, 22 mai-17 juin 1950*. Paris, UNESCO, 1950. 9 pp.

Mesures sur la coopération des États intéressés à la protection, conservation et restauration des antiquités, des monuments et des sites archéologiques ainsi que sur la possibilité d'établir un fonds international pour subventionner les travaux de conservation et de restauration.

67. U. S. National park service. *Museum training course [5th annual] January 12-February 6, 1953*. Washington, D. C., 1953. 24 l. Typewritten.

Several museums in Washington area are cooperating with Park Service in showing the class behind the scenes and demonstrating techniques. Contents: Schedule; The literature of museum work; Accessioning and cataloging; Problems of identification; Storage and use of study collections; Preservation of museum specimens; Making plaster molds and casts; Types of museum exhibits; Measuring the effectiveness of exhibits; Museum planning; Museum visits; Educational use of museum exhibits; Designing and installing a special temporary exhibit; Label writing; Trailside exhibits; The place of the museum in the National Park Service. Reviewed in: *ICOM news*, 5 (Aug. 1952), p. 30.

BMU



## B. FRAMING, MOUNTING, EXHIBITION, AND STORAGE

68. BAZIN, GERMAIN. Principes d'encadrement des peintures anciennes. *Mouseion*, 55-56 (1946), pp. 279-306, 23 illus.  
Historique du cadre et évolution de ses formes. PC
69. Eastman kodak company, Rochester, N. Y. *Storage of microfilms, sheet films, and prints* (safety film base and paper base materials only). Rochester, N. Y., c1951. 15 pp.  
Contents: Introduction; Protection required; Classification of records; Short-term storage—preparation for storage—fire protection—storage relative humidity—storage temperatures—chemical contamination; Archival storage—specification for archival storage; Moderate-term storage; Storage of sheet-film records; Storage of photographic-paper records; Handling film; Summary; Test references; Summary table; Tests for permanence; Bibliography. BMU
70. HATT, ROBERT T. Plastic display features. *M. J.*, 43 (1944), p. 155.  
IG
71. HOARE, R. R. Display of reproductions of scarce and valuable objects. *M. J.*, 43 (1944), p. 155.  
Use of methyl methacrylate. IG
72. Italian museums and the National Gallery. [Editorial.] *Burl. Mag.*, 92 (1950), p. 307.  
The hanging policy in Italian museums is discussed and approved for its intelligence and taste, particularly in the use of dull pale colors as backgrounds. In the National Gallery, on the other hand, use is made of tinted walls and curtains, including pink in the Rembrandt room. SRJ
73. KÄLLSTRÖM, OLLE. The use of plastic mounts for the specimens of goldsmith's art. *Museum (Paris)*, 5 (1952), pp. 108-109, illus.  
Illustrated examples of the use of Perspex (acrylic resin) for mounting. SRJ
74. KIMBERLEY, ARTHUR E. New developments in record containers. *Amer. Archiv.*, 13 (1950), pp. 233-236.  
After listing the characteristics of an ideal container, the advantages of a pressboard container clad inside and out with shiny aluminum foil are described. RJG
75. LIBERTI, SALVATORE. Nota sull' "Éternit." *Boll. ist. centrale restauro*, 5-6 (1951), pp. 17-20.

L'exposé confirme les résultats publiés précédemment (*Ibid.*, 1 (1950), pp. 21-25) et contredit les observations du professeur Gallo sur l'emploi de l'Éternit. FD

76. STECKZÉN, BIRGER. Storage and preservation of maps in Swedish military archives. *Indian Archives*, 4 (1950), pp. 14-19, illus.

Covers briefly housing, storage, outsize maps, classification, cataloging, indexing, repair and mounting, and service. RJG

77. Whitehall ceiling. *Burl. Mag.*, 93 (1951), p. 309.

An editorial recording the reinstallation after cleaning of Rubens' nine paintings for the Whitehall Banqueting Hall ceiling. The present lighting system is considered to be unsatisfactory owing to glare. SRJ

#### C. CONTROL OF AGENCIES OF DETERIORATION (ATMOSPHERIC POLLUTION, DUST, HUMIDITY, AND PESTS)

78. Air-conditioning and new lighting at the National Gallery. *M. J.*, 50 (1950), pp. 153-154.

In the new installation for Gallery XXIX temperature is maintained at 65° F. and r.h. at 58 percent throughout the year and 24 hours each day. There are six complete changes of air each hour; 90 percent of it is returned to the plant room for re-use. The air is cleaned by passing through a cloth screen and then through a water spray. Lighting is supplied by a bank of fluorescent tubes around the room; they are concealed within a system of deep louvres which form a pattern in the laylights. RJG

79. CARR, D. S., and HARRIS, B. L. Solutions for maintaining constant relative humidity. *Ind. Eng. Chem.*, 41 (1949), p. 2014.

Fourteen solutions reported for 15° to 30° C.; sixteen for 80° to 90° C. Seventy-seven solutions in all, ranging from 20.4 to 85.0 percent relative humidity and 15° to 90° C. RLF

80. CRISTOL, STANLEY J., and HALLER, H. L. The chemistry of DDT—a review. *Chem. Eng. News*, 23 (1945), pp. 2070-2075; *C.A.*, 40 (1946), 666.

A review with 49 references.

81. DUNLAP, M. E. Methods of controlling humidity in woodworking plants. *FPL Report R1612* (rev. 1953). 4 pp., table, figs.

Though the report deals with the stability of wood during manufacture, the discussion and the tables have a bearing on museum prob-

lems. Variations in relative humidity inside heated buildings are great between summer and winter conditions but may be moderated by use of suitable control equipment. RDB

82. FLEETWOOD, GUSTAV. The conservation of medieval seals in the Swedish Riksarkiv. *Amer. Archiv.*, 12 (1949), pp. 166-174. Tr. and condensed from: *Meddelanden från Svenska Riksarkivet för år 1946*.

The number of medieval wax seals in the Swedish *riksarkiv* is estimated at about 30,000. A large porportion are damaged. The principal cause of the breaking up of seals is the activity of a ray fungus whose growing spores perforate the wax of the seal and form microscopic canals with a diameter of about 0.001 mm. Evidence of the fungus appears first as whitish-gold spots, which gradually spread over the seals. The wax changes to an opaque whitish-yellow substance which crumbles. A vacuum apparatus is described (with diagram) in which parchment documents can be placed and the seals, which hang from a parchment strap, are impregnated with a wax substitute. Formula of the substitute is 200 g. French turpentine, 10 g. linseed oil, 5 g. solution containing cobalt and linseed oil (*c.* 50 percent), 3 g. solution containing copper (*c.* 50 percent), 15 g. benzene, 5 g. *Barnstens* lacquer (ed. note: not identified). RJG

83. KEELEY, T. R., and RAWLINS, FRANCIS IAN GREGORY. Air conditioning at the National gallery, London. *Museum (Paris)*, 4 (1951), pp. 195-200, illus.

The 5-year sojourn of the National Gallery collection in Manod slate quarry in Wales during the war demonstrated the beneficial effects of constant temperature and humidity in the preservation of panel paintings. This has stimulated the Ministry of Works to install in Gallery XXIX a complete air-conditioning system. "The design of the air-conditioning plant is based on the well-established pattern of the filtration of fresh air, mixed with recirculated air. The makers' guaranteed efficiency is 99.9 percent for particles down to two microns. The filtered air passes through a pre-heater battery, of the hot-water pattern thermostatically controlled by a dew-point element, placed beyond the humidifying chamber. This chamber with its finely divided water sprays is capable of controlling the amount of moisture in the air stream. When the heat content of the mixed air entering the washer exceeds the desired amount, the preheater is automatically 'cut' and chilled water from a refrigerating plant is admitted to the spray water, thus reducing the saturated air to the desired temperature. The saturated air stream is then warmed to whatever temperature is required in the gallery and regulated automatically by an element placed in the return air duct from the gallery." Thus the air leaving the plant has been cleaned by filters, given its required amount of moisture and finally warmed to the desired degree for the comfort of the spectators and the welfare of the pictures. RJG

84. KROGH, AUGUST. The dust problem in museums and how to solve it. *M. J.*, 47 (1948), pp. 183-188.

Facts and figures about the penetration of dust into closed places caused by changes in temperature and in barometric and wind pressures. Data on various types of dust filters. Practical methods for dust-proofing museum storerooms, cabinet drawers, show cases, and framed pictures. RJG

85. LASSEN, LEON. Influence of temperature on relative humidity within confined spaces with and without a desiccant. *FPL Report R1498* (1945), 31 pp., tables, chart.

Information is given on those properties of silica gel and wood that are instrumental in controlling the relative humidity within a package or similar closed space. The influence of thickness, relative humidity, and pressure on the permeability constant of permeable barriers is also discussed. Many data are presented in tables and charts. RJG

86. MARSH, ARNOLD. *Smoke, the problem of coal and the atmosphere*. Ch. 6. *The destruction of property*. London, Faber and Faber, 1947. pp. 94-107, illus.

Discusses smoke effects on: Building materials; Metals; Fabrics; Leather; Works of art. BMU

87. MEETHAM, A. R. *Atmospheric pollution, its origins and prevention*. London, Pergamon press ltd., 1952. 268 pp., illus. diagrs., tables.

Contents: Introduction; Origin of fuel; Natural fuels; Artificial fuels; Industrial boilers; Power and electricity; Industrial furnaces; Domestic fires; Atmospheric pollution; Measurement of atmospheric pollution; Distribution of pollution; Changes in pollution; Effects of pollution; Prevention of atmospheric pollution; The law and its administration; Index.

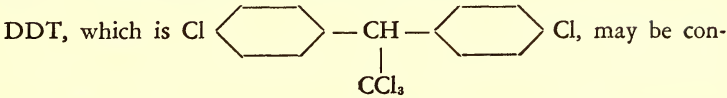
Reviewed: *Conservation*, 1 (1952/54), p. 142, by F. I. G. Rawlins. BMU

88. MONCRIEFF, R. W. *Mothproofing*. London, Leonard Hill Ltd., 1950. 200 pp., pls.

Contents: Clothes moths and house moths; Carpet beetles; The nature of the damage caused by wool pests; Mothproofing with dyestuffs; Mothproofing with fluorides; Mothproofing with colourless dyestuffs of the triphenylmethane series; Mothproofing with Mitin FF; Mothproofing with pentachlorophenol; Mothproofing with DDT; Mothproofing with phosphonium compounds; Mothproofing with formaldehyde; The nutritional requirements of the clothes-moth larvae; Mothproofing by modification of the molecular structure of wool; Mothproofing during dry-cleaning; Infestation precautions and remedies; Breeding and rearing moths; Testing the mothproof; References; Name index; Subject index. BMU



89. Moss, A. A. DDT *M.J.*, 46 (1946), pp. 21-22.



sidered as two monochlorobenzene molecules linked to a chloroform residue and hence is not greatly different from materials which have long been used for museum disinfection purposes. It is a remarkably effective insecticide in low concentrations; it is computed that one billionth of a gram per square centimeter of surface will poison a moth, caterpillar, or fly. A proposed moth preventive spray has the following approximate composition:

Pyrethrum extract (20 percent w/v pyrethrum).....	2 fluid oz.
Sesame oil, active.....	10 fluid oz.
DDT Technical (not less than 70 percent DDT).....	$\frac{1}{4}$ lb.
White spirit (kerosene).....	5 gal.

The pyrethrum extract activated by the sesame oil is incorporated on account of its "knock down" effect on adult moths. It is not considered that DDT in this concentration is harmful to humans. DDT is stable and does not decompose under the influence of light or by oxidation. It is reacted upon, however, by hot alkaline solutions and is decomposed by hot water to give hydrochloric acid. Under normal usage, however, it has been found by the British Museum Laboratory that it is unlikely to damage wood, metals, or fabrics. It is not known to affect adversely modern dyestuffs. What action it may have on ancient dyestuffs has not been determined; this is a matter for further study.

RJG

90. ŌTSUKI TORAO 大槻虎男, IWASAKI TOMOKICHI 岩崎友吉, EMOTO YOSHIMICHI 江本義理, and SAITŌ HEIZŌ 齋藤平藏. Studies on dust particles scattered in the air of the museum. Part I.-II. *Sci. Pap. Japn. Antiques*, no. 1 (Jan. 1951), pp. 21-24; no. 2 (Oct. 1951), pp. 16-23.

Dust scattered in the air of the National Museum of Tokyo was studied during November 11-29, 1948. Dust samples were collected in glass dishes containing glycerine which had been placed in the show cases. Several thousand particles per sq. cm. were collected during that period. Dusts consisted mainly of mineral particles with small amounts of fibres. Very few micro-organisms were found. The same experiments as in Part I were done in May 30-June 14, 1949, and February 7-22, 1950, in the National Museum of Tokyo. The number of micro-organisms increased in summer and decreased in winter. Dust particles in the air of the interior of the Shō-sō-in, Nara Imperial Treasure House, are fewer than those of the Museum of Tokyo.

KY

91. SAITŌ HEIZŌ 齋藤平藏. On the moisture of the storehouses of national treasures. *Sci. Pap. Japn. Antiques*, no. 1 (Jan. 1951), pp. 49-54.

Relative humidities and temperatures in the storehouses of the National Museum of Tokyo were determined from May 1948 to August 1949, and the results are discussed. KY

92. SCHEFFER, THEODORE C., and DUNCAN, C. G. Fungistatic vapors for control of mold in packages and equipment. *Ind. Eng. Chem. Ind. Ed.*, 38 (1946), pp. 619-621.

Results with 47 chemicals are listed. Most promising from standpoint of effectiveness, moderate evaporation tendency, and a solid state at ordinary temperatures, as indicated by trials on wood, leather, malt-agar, and pressure tape, were *p*-dichloro-benzene, Insl.-X Volatile fungicide, and ethyl mercuric chloride. RDB

93. SCHEFFER, THEODORE C., and TORGESON, OSCAR W. Humidifying apparatus for small test rooms. *FPL Report R1752* (1949) 2 pp., figs.; *Science*, 110 (Aug. 26, 1949), pp. 214-215.

The apparatus makes use of a wood-element hygrostat and heat-controlled evaporation of water. The water is evaporated by heat supplied electrically in response to movement of the wood element against a microswitch. It is capable of controlling the humidity in rooms of 600-cubic-foot capacity with well-sealed walls. This hygrostat will operate reliably over a period of years and will maintain control of relative humidity up to 70 percent with deviations of about plus or minus 2 percent. Detailed diagrams are given. Information may have application in design of museum storage areas and in experimental techniques. RDB

94. SOLOMON, M. E. Use of cobalt salts as indicators of humidity and moisture. *Ann. Appl. Biol.*, 32 (1945), pp. 75-85; *C.A.* 39 (1945), 5140.

This method of using paper impregnated with cobaltous salts offers a simple procedure for measuring humidity in small spaces.  $\text{CoCl}_2$  is blue at low humidities, pale red at high humidities, with a graded series of lilac colors between. Correspondence between color and relative humidity (R.H.) is close, though the color is influenced slightly by temperature. Color is determined chiefly by the relative quantities of  $\text{CoCl}_2$  and water in the paper. Preparation of  $\text{CoCl}_2$  paper: Dried filter paper is immersed in a 2.165 *N* solution for 1 minute at 20°. The wet paper is pressed between 2 changes of desiccator-dried filter paper and allowed to dry slowly at room humidity. With care, R.H. can be measured with this paper within 2 percent in the 40-70 percent range, and to within 5 percent above and below this range (except low humidities at low temperatures). R.H. is estimated by matching the colors of the paper by eye against calibrated standard papers prepared as follows: KOH solutions are made up to give R.H. intervals over the desired range (cf. *C.A.*, 28, 7136). The KOH solutions are placed in rubber-stoppered bottles,  $\text{CoCl}_2$  paper is suspended in each bottle for 2 hours at constant temperature; then the paper is immersed in liquid



paraffin, doubled over to intensify the color, and mounted in liquid paraffin between opal glass and clear glass. Excess liquid paraffin is removed by pressure and the edges of the standard are sealed with a stiff solution of Na silicate. Standards so prepared keep for at least 4 months. Various substrates other than paper (e.g., mercerized cotton) cause the blue color to persist at higher humidities. Certain salts (e.g., KSCN,  $\text{Na}_2\text{S}_2\text{O}_3$ ) produce a similar, but greater effect and stronger colors; their use affords greater accuracy at high humidities. Addition of  $\text{ZnCl}_2$  or certain other salts adapts the method for use at low humidities. Papers impregnated with  $\text{Co}(\text{CNS})_{2.1/2} \text{H}_2\text{O}$  are more suitable than  $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$  for use above 50 percent R.H. Preparation and use of these papers are described.

95. STOKES, R. H., and ROBINSON, R. H. Standard solutions for humidity control at 25° C. *Ind. Eng. Chem.*, 41 (1949), p. 2013.

Excellent data from 95 to 5 percent relative humidity using three common chemicals. Fifteen values also reported in four significant figures using a variety of compounds. Reported as activity of water (relative vapor pressure). Relative humidity is ordinarily taken as equal to this.

RLF

96. STOUT, GEORGE L. Air conditioning in storage. *W.A.M. News Bull. & Calendar*, 17 (1952), pp. 29-31, illus.

In the Worcester Art Museum storage room *A*, which holds panel paintings, furniture, and other objects primarily of wood, is conditioned  $52 \pm 3$  percent relative humidity. Storage *B*, which contains textiles, drawings, and prints, is kept at relative humidity  $40 \pm 1$  percent. Storage *C* for glass, ceramics, stone, and similar materials, is unregulated. If gallery conditions become unsuitable for a particular object, that object can be moved to the storage area that is appropriate. Dehydration in *A* and *B* areas is done with Carrier units (No. 53 Fr-179) controlled by a Minneapolis-Honeywell hair-element humidistat. The humidifier in storage *A* is a Walton open-tank model actuated also by a humidistat. It is able to evaporate about 1 gallon of water per hour.

RJG

97. TEITELL, LEONARD, and BERK, SIGMUND. Prevention of mold growth in optical instruments; Panama Canal Zone exposure, *Ind. Eng. Chem.*, 44 (1952), pp. 1088-1095, illus., table.

Various methods that have been used for inhibiting mold, including periodic cleaning, sterilization, dehumidification, and fungicidal treatment, are reviewed. The experimental work showed that Cresatin (*m*-cresyl acetate) vapor was the only treatment that completely prevented mold growth in binoculars. The Cresatin, however, was corrosive to the copper-alloy prism shields. Sodium ethylmercurithiosalicylate permitted some mold growth. Silica gel desiccators kept the humidity low for too short a period. Thanite (fenchyl thiocyanate) did not prevent mold growth. Ultraviolet germicidal lamps used to sterilize the interiors of binoculars during assembly did not prevent

mold growth. Waterproofed binoculars became moldy about as readily as relatively poorly sealed binoculars. The magnesium fluoride-coated lenses were subject to mold growth. RJG

98. TURNER, J. S. (*and others*). Tropic-proofing of optical instruments by a fungicide. *Nature (London)*, 158 (1946), pp. 469-472.

M.T.S. (sodium ethylmercurithiosalicylate), incorporated in luting wax and black lacquer, proved a very active fungicide and fungistat. Results of laboratory exposure tests and field experience are given. LB

99. U. S. Forest products laboratory, Madison, Wis. Relative-humidity and equilibrium-moisture-content tables for wet and dry bulb hygrometer. *FPL Tech. Note* No. 156, rev. June 1952.

Contents indicated by title.

100. VICKLUND, RICHARD E. Preventing the fungus fouling of optical instruments. *Ind. Eng. Chem.* 38 (1946), pp. 774-779; *C.A.* 40 (1946), 5187.

Optical glass rapidly deteriorates in the Tropics, owing to fungus growth on lenses. Volatile fungicides, such as metatolyl acetate and sodium ethyl mercuric thiosalicylate, are used as preventives but corrode metal and have a temporary effect. Radium sulfate and gold + barium sulfate foil, 0.003 inch thick, containing 15 $\gamma$  radium per square inch, as a collar about lenses, one-ninth the lens radius wide, prevented fungus fouling under severe testing conditions. The fungicidal effect is due to  $\alpha$  rays;  $\beta$  and  $\gamma$  rays are ineffective. The treatment can be used on lenses up to 3 inches diameter, is effective against numerous fungi, is economically feasible, and, when used on binoculars, transits, etc., is without health hazard to operating personnel. It applies to concave and convex lenses, and theoretically could be extended to lenses of 5 inches diameter if Ra C', with more penetrating rays, were substituted for Ra D.

101. VINCENT, J. F., *and* BRISTOL, K. E. Equilibrium humidity measurement. *Ind. Eng. Chem., Anal. Ed.*, 17 (1945), pp. 465-466; *C.A.* 39 (1945), 3705.

Rapid measurement of equilibrium humidity can be made in a simple, easily made manometric apparatus. Errors due to absorbed gases are avoided by measurement of the pressure exerted and after freezing out moisture vapor.

## D. LIGHTING INSTALLATIONS AND THE EFFECT OF LIGHT ON OBJECTS

102. COGNIARD, J., COREMANS, PAUL, and PLENDERLEITH, HAROLD JAMES. Comparative tests on the deterioration of pictures by light. *ICOM News*, 4 (Feb. 1951), pp. 2-3 (in French); pp. 21-22 (in English).

Interim observations by the ICOM Commission for the Scientific Study of Lighting Problems on some tests on the deterioration of paintings by light, which were started in March 1950 at the Laboratoire Central des Industries Électriques (Chantillon, Seine, France). Certain suggestions are made for enlarging the scope of the experiment and increasing the quality of the tests. RJG

103. ECKHOUT, P. Natural and artificial lighting at the Museum voor Schone Kunsten, Ghent. *Museum (Paris)*, 5 (1952), pp. 28-32.

During reinstatement of the war-damaged museum the opportunity was taken to improve the lighting. Thermolux (spun glass laminated between ordinary clear glass) was used in the daylight which is illuminated at night from above by mixed tungsten and fluorescent lamps. Measurements of chromaticity and distribution are given. SRJ

104. FITZ-GIBBON, A. D. Ultraviolet radiation from fluorescent lamps. *M. J.*, 52 (1952), pp. 106-107.

Genard's suggestion (*C.A.*, 46 (1952), 9421f) that radiation from fluorescent lamps may cause more fading of some exhibits in museums than daylight or incandescent light is denied. RJG

105. Fluorescent lighting in museums and galleries. *M. J.*, 50 (1950/51), p. 13.

In reply to claims that fluorescent lighting may be deleterious to museum objects the National Gallery Advisory Scientific Committee goes on record with the statement "no harm could possibly be done to the pictures, either on account of the emission of ultraviolet, or any other radiation." RJG

106. GENARD, J. Extreme ultra-violet radiation from tubular fluorescent lamps and its effects on museum lighting. *Museum (Paris)*, 5 (1952), pp. 53-65; *M. J.*, 52 (1952), pp. 5-18; *C.A.*, 46 (1952), 9421f.

Wavelength characteristics of various sources of light are reviewed. The ultraviolet radiation characteristics of 96 new tubular fluorescent lamps of 43 different types and makes are tabulated. In general, after a tube has been used for 1,000 hours the extreme ultraviolet radiation is 25 percent less. Many tubes emit ultraviolet radiation extending as far as 280-290mμ. Despite the low intensity of these radiations they

may over a long period accelerate the photochemical deterioration of materials. RJG

107. KÄLLSTRÖM, OLLE, and OLSON, GILLIS. Lighting methods for show-cases; exhibition and research work at the Statens Historiska Museum, Stockholm. (Museum Notes). *Museum (Paris)*, 4 (1951), pp. 201-211, illus.

The authors describe a museum display demonstrating some problems and technical principles concerned with lighting show cases. NLB

108. KELLY, RICHARD. Lighting as an integral part of architecture. *College Art J.*, 12 (1952), pp. 24-30.

Develops three elemental kinds of light effect which can be related to the art of painting for easier visualization: (1) Focal glow, (2) Ambient luminescence, (3) Play of brilliants. Lists numerous developments in artificial lighting over the past 25 years which affect the viewing of paintings. RJG

109. Lighting of museums and galleries. *Nature (London)*, 166 (Oct. 14, 1950), pp. 637-638.

This is the report of a discussion on museum and gallery lighting which took place during the Birmingham meeting of the British Association. Papers were read by W. E. Rawson-Bottom (Ministry of Works) and F. I. G. Rawlins (National Gallery, London). Efficient use of fluorescent lighting was stressed. Tests show the pictures possess reflectivities of around 10,20,35 percent of which 20 percent is by far the most common. Backgrounds are pleasing when they are of this order of reflectivity. RJG

110. MARKHAM, J. H. Élimination des phénomènes de réflexion. *Moussion*, 55-56 (1946), pp. 307-314, 9 illus.

Le principe a été exposé dans le *J. Roy. Inst. Br. Arch.*, mars 1925. L'auteur donne une série de détails pratiques à ce sujet et illustre son argumentation par des figures. PC

111. RAWLINS, FRANCIS IAN GREGORY, and RAWSON-BOTTOM, W. E. Ultraviolet radiation from fluorescent lamps. *M. J.*, 52 (1952), pp. 84-85; *C.A.*, 46 (1952), 9421g.

Some comments on the article by J. Genard in the April issue of the *M. J.* (See no. 106). Fugitive dyestuffs were exposed 12 inches distant from a warm-white fluorescent tube at 19.4° C. and 38 percent relative humidity for 24,000 footcandle hours under the following conditions: 1, Exposed to direct radiation from the lamp. No glass. 2, Same radiation but through ordinary window glass, 3 mm. thick. 3, Same radiation but through a glass filter opaque to all radiations <3,700 Å. Approximately equal fading occurred under all three conditions of exposure. The danger of fading of museum objects due to the normal use of fluorescent lighting is negligible. RJG



112. RAWSON-BOTTOM, W. E. Artificial lighting of museums. *M. J.*, 50 (1950), pp. 180-183.

For museum purposes the fluorescent "Daylight" lamps with color temperature approximating 4,500° (Kelvin) are the most effective for general use. Lamps with color temperature of 6,500° K. are effective in show cases where color rendering is of prime importance. Spot filament lamps are still useful for emphasis lighting. Fittings and special illumination problems are discussed. RJG

113. THORDEMAN, BENGT. Swedish museums. *Museum (Paris)*, 2 (1949), pp. 44-62.

In a number devoted to Swedish museums, the text and numerous illustrations on the pages indicated are concerned with museographical techniques, including lighting and storage. SRJ

#### E. PACKING AND TRANSPORTATION

114. American association of museums. Packing and handling of art objects. *Museum News*, 26 (Sept. 1, 1948), pp. 7-8.

A report of a joint section meeting at the A.A.M. Convention in Quebec, May 1947, by George L. Stout, Charles M. Richards, and Robert S. Sugden covers: Construction of packing cases—cover attachment, waterproofing, interior partitions, separators, size, sculpture, large and heavy objects, large statuary, padding and wrapping, fragile frames, unframed pictures and fragile objects, and sculpture. "Good as it is, the best packing done today takes little advantage of technological developments made through applied science within the past century." RJG

115. GÉRARD, R. Museum treasures. *SAMAB*, 5 (Sept. 1951), pp. 1-3.

The dangers in respect to physical damage attendant upon lending works of art is reviewed. RJG

116. MORLEY, GRACE L. McCANN (*and others*). Museums and circulating exhibitions. *Museum (Paris)*, 3 (1950), pp. 261-316.

An international survey by various authors with an introduction by Grace Morley, which includes details of transport and package methods as well as exhibition technique. Sixty-six illustrations. SRJ

117. New York. Museum of modern art. Packing of a circulating exhibition. *Museum (Paris)*, 3 (1950), pp. 267-269, illus.

Illustrations only, with detail captions in French and English. RJG

118. SUGDEN, ROBERT P. *Care and handling of art objects*. New York, The Metropolitan museum of art, 1946. 34 pp.  
 Contents: Foreword; Paintings; Large objects; Small objects; Textiles; Works on paper.  
 This is a primer on the subject; it is well illustrated. It gives definite instructions on handling museum objects in the form of "do's" and "don't's."  
 RJG
119. SUGDEN, ROBERT P. *Safeguarding works of art; storage, packing, transportation and insurance . . .* New York, Metropolitan museum of art, 1948. 80 pp., illus.  
 Contents: Introduction; Storage; Packing; Transportation; Insurance; Bibliography; Index.  
 BMU

#### F. EMERGENCY PROTECTION

[This subsection is limited because the subject has been so adequately covered by the bibliography compiled by Nelson R. Burr (*See* item no. 125). The items given here are not covered by Burr.]

120. COREMANS, PAUL B. The recovery of Belgian art treasures from the Germans. *Belgium (New York)*, 7 (1946), pp. 176-182, illus.  
 A short account of what happened to a few important Belgian works of art during the war, 1939-1945, and their recovery.  
 PC
121. GALLAGHER, CHARLES F. War damage to Japanese art treasures. *O.A.*, 1 (1948/49), pp. 117-119, illus.  
 War damage to art treasures in proportion to the destruction of ordinary property and industrial installations was miraculously slight. Of 7,424 objects and structures registered as National treasures only 293 (or approximately 3.9 percent) were either destroyed or damaged, and this figure included many pieces which suffered only moderate damage. The more important losses are listed.  
 RJG
122. La Haye. Bur. national pour la protection des monuments. *Rapport du directeur*. La Haye, 1950. 5 pp.  
 Dispositions prises aux Pays-Bas en vue de la protection des monuments historiques et autres biens culturels en cas de conflit armé. BMU
123. PANE, ROBERTO. Some considerations on the meeting of experts held at UNESCO House, 17th-21st October, 1949. *Museum (Paris)*, 3 (1950), pp. 48-89, illus.



A report by an international committee on the problems of protecting "artistic and historical monuments and sites and of archaeological excavations." The report is illustrated with examples of the various problems particularly in the restoration of war-damaged buildings. SRJ

124. PLENDERLEITH, HAROLD JAMES. Preservation of museum objects in war-time. *Nature (London)*, 152 (1943), pp. 94-97.

Tabulates causes of damage and analyses the relative values of various materials and methods used in packing and storage. The usefulness of dry hygroscopic material is stressed, and conditions of storage at  $60 \pm 5$  percent R.H. and  $60 \pm 5^\circ$  F. are recommended. LB

125. U. S. Library of Congress. Reference department. *Safeguarding our cultural heritage; a bibliography on the protection of museums, works of art, monuments, archives, and libraries in time of war.* Compiled by Nelson R. Burr. Washington, D. C., U. S. Govt. print. off., 1952. 117 pp.

An annotated bibliography with author index.

Reviewed in: *Historic preservation*, 4 (Fall 1952) under title "Preservation in time of war," by Helen D. Bullock; *Conservation*, 1 (1953), p. 92, by A. E. Werner. BMU

### G. FIRE PREVENTION

126. BOND, HORATIO. *A "first book" on fire safety in the atomic age.* Boston, Mass., National fire protection association, 1952. 72 pp., illus.

Contents: Foreword; Author's preface; Fire safety in the atomic age; Building in the atomic age; Continuing fire; Primary fire effects; Conflagration and fire storm; Fire fighting; Buildings and structures; Outdoor storage; Combustible buildings; "Occupancy" and fire loading; Fire-resistive buildings; Steel frame buildings; Top limits of fire loading; Compartmentation; Automatic sprinklers; The fate of cities; Bibliography; Index. BMU

127. DOMINGE, CHARLES CARROLL, and LINCOLN, WALTER O. *Building construction as applied to fire insurance and inspecting for fire underwriting purposes.* 4th ed. Philadelphia, New York, The Spectator, 1949. 187 pp., illus.

Contents: Preface; Introduction; Frame (or combustible) construction; Ordinary brick or non-fireproof construction; Mill construction (sometimes called); Slow-burning or heavy timber construction; Fire

resistive (but more commonly and incorrectly called) fireproof construction; Inspecting for fire underwriting purposes; Automatic sprinkler systems; Review of plans, fire resistive buildings; Fire resistance ratings; Appraisals; Students examination questions; Some terms used in building construction; Books on building construction. BMU

128. LUNSINGH-SCHEURLEER, D. F. *Sécurité incendie dans les musées*. Paris, 1950. 5 pp. (Conseil International des Musées, 2 conférence biennale, Londres, 17-22 juillet 1950).
129. MEYER, JOHANNES. *Feuerschutz; handbuch für den Feuerwehrdienst, für Brandschau, Bauaufsicht und Brandermittlung*. Braunschweig, L. H. Grosse, 1950. 167 pp., illus.  
 Contents: Geschichtliche Entwicklung; Der vorbeugende Feuerschutz: 1. Allgemeines. 2. Normen und Begriffsbestimmungen. 3. Verhalten der Baustoffe im Feuer. 4. Brandabschnitte. 5. Feuergefährliche Anlagen und Einrichtungen. 6. Vergnügungs- und Versammlungsstätten. 7. Treppenhäuser und Notwege. 8. Blitzschutzanlagen. 9. Der Feuerschutz öffentlicher Gebäude; Abwehrender Feuerschutz: 1. Die Feuerwehr. 2. Geräte, Ausrüstungen und Einrichtungen. 3. Feuerlöschtaktik. 4. Nachrichtenmittel; Ermittlung von Brandursachen: 1. Brandursachen nach Art der Entstehung. 2. Brandursachen in Räumen und Betrieben. 3. Aufgaben des Feuerwehrführers bei der Mitarbeit zur Ermittlung von Brandursachen. BMU
130. NOBLECOURT, ANDRÉ. *La protection contre l'incendie des musées d'art et d'histoire*. Paris, 1950. 5 pp. dactyl.
131. NOBLECOURT, ANDRÉ. *Protection des musées contre l'incendie*. Rapport sur une mission effectuée à Londres les 20, 21 et 22 juillet 1950, 7 pp., dactyl.
132. Paris. Conseil international des musées. *La sécurité incendie dans les musées*. Bibliographie au 25 mars 1950. 3 pp., dactyl.

#### H. SALVAGE WORK IN FIELD EXCAVATIONS

133. ATKINSON, R. J. C. *Field archaeology*. London, Methuen & co., ltd., 1946. 238 pp., illus., pls., diagrs.  
 Contents: Introduction; Field work; Excavation; Archaeological surveying; Recording; Photography; Interpretation; The publication of archaeological reports; Glossary of archaeological terms; App. I. The cleaning and restoration of finds; App. II. Treasure trove; App. III.

Experimental techniques; Tables I-II. Selected bibliography; Index. Description of plates.

Reviewed in: *Nature*, 159 (1947), p. 387, by C. F. C. Hawkes.  
BMU

134. BARGHOORN, E. S. Collecting and preserving botanical materials of archaeological interest. *Amer. Ant.*, 9 (1943/44), pp. 289-294.

Basic rules are: (1) Collection of intact specimens or the largest possible fragments; (2) recording of accurate data regarding the position of specimens in the site and the nature of the medium in which they are found; and (3) adequate preservation or storage of the material collected. Specific directions are given for the preservation of peat, seeds and leaves, wood and charcoal.

RJG

135. BERNAL, IGNACIO. *Introduccion a la arqueologia*. Pánuco, México, Fondo de cultura económica, 1952. 163 pp., pls.

Contents: Prólogo, por Alfonso Caso; Generalidades; El arqueólogo en el campo; Estratigrafía; Exploración de tumbas; Tratamiento de los objetos; Exploración de edificios; Documentación fotográfica; Levantamiento de croquis; Reconstrucción de edificios; El arqueólogo en el laboratorio; Apéndices; Bibliografía; Índice de figuras; Índice de láminas; Índice general.

BMU

136. FRANKLIN EWING, J. S. I. A new technique for removing bones from limestone breccia. *Antiquity*, 24 (1950), pp. 102-105.

A description of the use of acetic acid and sodium hydroxide to dissolve the breccia. "Tornesite," a chlorinated rubber varnish to protect exposed parts of the bone.

IG

137. HEIZER, ROBERT FLEMING (ed.) *A manual of archaeological field methods*, rev. ed. Prepared for use by the Archaeological Survey and the Department of Anthropology of the University of California at Berkeley. Millbrae, Calif., National press, c1950. 85 pp., illus., maps.

Contents: Preface; Introduction; Aerial site survey; Interpretation of data; Preparation for excavation; Methods of excavation; Recording excavation data and collecting artifacts; Features; Excavation and recording skeletal remains; Structural remains; Recovery and significance of unmodified faunal remains; Stratigraphy and chronologic methods; Photographic records; Care and preservation of archaeological specimens; Field catalogue; Typology; Cultural classification in Central California; Recording local collections; State and federal regulations concerning archaeological sites; The names and distribution of recent California Indian tribes; Chronological methods; General reference bibliography; References cited in text.

BMU

138. KENYON, KATHLEEN M. *Beginning archaeology*. London, Phoenix house limited, 1952. 203 pp., pls., diags.

Contents: Foreword; The meaning of archaeology; The framework of archaeology; Fields of archaeological work; How to become an

archaeologist; The technique of field work—Excavating; The technique of field work—Recording; The technique of field work—Dealing with finds; Field work—Field surveys and air photographs; Appendices: I. Bibliography; II. Archaeological training in universities. III. British schools of archaeology; IV. Archaeological posts. V. Archaeological societies; Index. BMU

139. MOHD, KHAN BAHADUR, and ULLAH, SANA. Notes on the preservation of antiquities in the field. *Anc. India*, no. 1 (Jan. 1946), pp. 77–82.

In Technical Section 1, practical methods are briefly described for treating pottery, stone, faience, metals, and organic materials. Included is a detailed list of chemicals and equipment needed for an archaeological field laboratory at a major excavation. Archaeological photography, by M. B. Cookson. *Ibid.*, No. 2 (July 1946), pp. 134–137; Technical Section No. 2. Recording archaeological strata. *Ibid.*, No. 3 (Jan. 1947), pp. 143–150; Technical Section, No. 3. Further notes on digging and recording, by R. W. M. Wheeler. *Ibid.*, No. 4 (July 1947–Jan. 1948), pp. 311–321. RJG

140. SMITH, WATSON, and EWING, LOUIE. Field methods of excavation, preservation, and reproduction of mural paintings. In *Their Kiva mural decoration at Awatovi and Kawaika-a . . .* Cambridge, Mass., 1952, pp. 33–52. (Harvard University. Peabody museum of archaeology and ethnology. Papers, vol. 37.)

Covers in detail the process developed for the stripping and separating of superimposed layers of painted adobe plaster on kiva walls. Gives formulas of the plastic stripping solution used for applying facings; describes the technique employed in pulling the paintings and in transferring them to separate and independent Untempered Masonite Presdwood supports. RJG

141. TOOMBS, H. A., and RIXON, A. E. Their correspondence on removal of bones from other matrix. *Antiquity*, 24 (1950), p. 141.

Describes the use of polystyrene in ethyl acetate to strengthen and protect the bone and acetic or formic acid to remove the matrix. (See no. 136.) IG

142. UNWIN, MAX. A new method for the impregnation of wet objects in the field. *M. J.*, 50 (1951), p. 237; *C.A.* 45 (1951), 4975g.

Wet objects in archaeological sites, like wool and bone, can be hardened with a 20 percent wt./vol. polyvinyl acetate in toluene emulsified with 25–40 percent of a wetting agent like "Teepol." The method of application is described. RJG



## I. RELATIONS TO THE PHYSICAL SCIENCES

143. Ancient mining and metallurgy. *Antiquity*, 24 (1950), p. 145.

Committee formed by the Royal Anthropological Institute to investigate problems of ancient mining and metallurgy. It is at the service of archaeologists and will advise and sometimes carry out analyses. IG

144. AUGUSTI, SELIM. *Tecnica e restauro*. Napoli, Miccoli, 1949. 5 pp.

Généralités. Nécessité de l'exécution de l'examen scientifique avant restauration, de la réunion d'informations techniques et de la formation des restaurateurs. JT

145. CAGIANO DE AZEVEDO, MICHELANGELO. The scientific restoration of works of art. *East and West*, 1 (1950), pp. 118-121, illus.

A statement of the policies and the new approach to restoration which are being carried on under the direction of Cesare Brandi at the Istituto Centrale del Restauro at Rome. RJG

146. CALEY, EARLE R. Application of chemistry to archaeology. *Ohio J. Sci.*, 48 (1948), pp. 1-14; *C.A.*, 42 (1948), 2483.

147. CALEY, EARLE R. Archaeological chemistry. *Chem. Eng. News*, 27 (1949), pp. 2140-2142; *Cf. C.A.* 42 (1948), 2483*d*; *C.A.*, 43 (1949), 6478*d*.

The chemical examination of ancient materials and objects can contribute much to archaeology. Examples are given of the identification of materials, of the determination of their sources, and of the application of chemical data to the dating of objects and the determination of their uses. Problems of chemical changes during burial and methods for restoration and preservation of antiquities are discussed. It is proposed to call this field of investigation "archaeological chemistry."

148. CALEY, EARLE R. Chemical investigation of ancient materials and objects. *Science Counselor*, 14, no. 4 (1951), pp. 114-115, 138-139.

A knowledge of the chemical composition of such materials and objects is interesting to the chemist and useful to the archaeologist. A very considerable number of specimens of ancient metals, alloys, pigments, ceramic materials, and even organic materials have been analyzed. The information obtained by these analyses has often been useful to the archaeologist in establishing the exact identity of materials, the technique employed in the manufacture of objects, the cultural or economic status of ancient peoples, and the dating of materials and objects. A knowledge of their composition is often useful for restoring or preserving them for study or for exhibition in museums.



Much remains to be done before our knowledge of the chemical composition of ancient materials and objects reaches a satisfactory state.  
ERC

149. CERCLE DES ALUMNI DES FONDATIONS UNIVERSITAIRES. Art et science. *Alumni*, 19 (juin 1950), pp. 246–387, illus., map.

Contents: Editorial: Le nettoyage et la restauration des peintures anciennes; Position du problème, by René Huyghe; Le point de vue du critique d'art, by Paul Fierens, pp. 262–267; Het standpunt van de museum directeur, by Walther Vanbeselaere, pp. 268–275; Le point de vue du laboratoire, by René Sneyers, pp. 276–281, illus.; The viewpoint of the conservator, by George L. Stout, pp. 282–291; illus.; L'introduction d'un nouveau critère dans l'appréciation des oeuvres d'art: Les sciences naturelles, by Paul Coremans, pp. 292–301, bibliographie; Les sciences naturelles au service de l'archéologie, by S. J. De Laet, pp. 302–317; "The mathematical basis of the arts" de Joseph Schillinger, by Raymond Sneyers, pp. 318–321; Is de kunsthistorie een wentenschap? by Herman Baeyens, pp. 322–331; The history of medicine versus the history of art, by George Sarton, pp. 332–341; Lapis lazuli and ultramarine in ancient times, by Rutherford J. Gettens, pp. 342–357, map, Bibliography; Le perspective est-elle une science ou un art? by Suzanne Sulzberger, pp. 358–365, pls.; Het paneel en zijn parketering, by R. A. d'Hulst; pp. 366–381, illus.; The philosophy of science and art, by F. I. G. Rawlins, pp. 382–387. PC

150. CLARKE, Sir KENNETH. Science in the service of art. *Nature (London)*, 151 (1943), p. 133.

Short note on Mr. Rawlins' work in the National Gallery since 1934.  
LB

151. Conference on archaeological field and laboratory techniques, New York. 1950. *Essays on archaeological methods*: Procedures of a conference held under the auspices of the Viking Fund. Edited by James B. Griffin. Ann Arbor, University of Michigan press, 1951. 151 pp. (Michigan University. Museum of anthropology. Anthropological papers, no. 8.)

Contents: Introduction, by James B. Griffin; Recent advances in surveying techniques and their application to archaeology, by Albert C. Spaulding; The use of earth-moving machinery in archaeological excavations, by Waldo R. Wedel; Collaboration among scientific fields with special reference to archaeology, by Frederick Johnson; Recent developments in the treatment of archaeological textiles, by Junius Bird; Principles in the conservation of mural paintings, by Rutherford J. Gettens; Chemical analysis of fossil bone, by Sherburne F. Cook; Metallurgical analyses and their aid to archaeology, by William C. Root; Applications of X-ray to archaeology, by Paul F. Titterton; Carbon<sup>14</sup> dating, by Donald Collier; Ceramic technology as an aid to cultural interpretation—techniques and problems, by Frederick R. Matson; The

use of mathematical formulations in archaeological analysis, by George W. Brainerd; The use of IBM machines in analyzing anthropological data, by Frederick P. Thieme; Final session; Participants; Selected bibliography. BMU

152. COREMANS, PAUL B. Les méthodes d'investigation scientifique des oeuvres d'art. *Apollo (The Hague)* n° 18 (1948), 4 pp., 4 illus. (A paru également en langue néerlandaise).

Généralités.

PC

153. EVANS, D. S. The painter and the scientist. *Discovery*, 5 (1944), pp. 258-260; *Review*, 17 (1944), p. 257.

An illustrated account of the work of F. I. G. Rawlins at the National Gallery. Examination of the individual coats comprising a painting gives information as to its age, authenticity and the technique used by the painter.

154. FELLER, ROBERT L. Science serving the fine arts. *Carnegie Mag.*, 26 (February 1952), pp. 46-49. Reprinted: *Art material trade news*, 4 (May 1952, p. 27 and June 1952, p. 23.)

A general discussion of scientific methods which have been applied to the care of objects of art.

RLF

155. GEILMANN, W. Chemistry and archaeology. *Naturwissenschaften*, 37 (1950), pp. 97-102, 121-8; *C.A.*, 44 (1950), 8176.

Chemical changes occurring in various types of artifacts are discussed and many illustrations given.

156. GETTENS, RUTHERFORD J. Science in the art museum. *Sci. Amer.*, 187 (July 1952), pp. 22-27, illus.

Popular article describing mainly examples of scientific examination and conservation in art at the Fogg Museum of Art.

RJG

157. HAWKES, CHRISTOPHER F. C. British prehistoric archaeology; recent aims, methods and results. *Nature (London)*, 157 (1946), pp. 717-720.

Gives examples of the dependence of archaeological research on data provided by physical science.

LB

158. HOURS, MAGDELEINE. Les méthodes scientifiques au service de l'archéologie. *Comp. Rend. A. I.* (1952), pp. 435-442.

An account of scientific studies of objects in metal, wood, ceramics, and stone carried on with the aid of collaborators from various fields.

RJG

159. IVES, HERBERT EUGENE. *Physics and art*. New York, U. S. Rubber Co., 1946.

A radio talk given Dec. 22, 1946, under the sponsorship of the U. S. Rubber Company.

160. LAMING, ANETTE, *ed.* *La découverte du passé. Progrès récent et techniques nouvelles en préhistoire et en archéologie.* Paris, A. et J. Picard & Cie., 1952. 363 pp., tables, diagrs., map.

Contents: L'introduction et les notes préliminaires aux quatre parties de l'ouvrage ont été rédigées, par A. Laming; La photographie aérienne, par G. Bailloud, et P. Chombart de Lauwe; Méthodes électriques de prospection, par R. J. C. Atkinson; Le détecteur électro-magnétique, par A. Laming. Pt. II. Le milieu préhistorique: L'étude des sédiments, base de la reconstitution du milieu physique—le sol, les eaux, le climat; Étude des vestiges zoologiques, par A. Leroi-Gourhan; L'étude de la flore, par G. Lemée. Pt. III. Le cadre chronologique: L'analyse des cercles de croissances, par A. Laming; La datation des os fossiles par l'analyse de leur teneur en fluor; par K. P. Oakley; Le C<sup>14</sup>: La datation des matériaux archéologiques et géologiques par leur contenu en carbone radioactif, par Hallam L. Movius; L'aimantation thermorémanente des terres cuites, par A. Laming (avec la collaboration de E. Thellier); Pt. IV. L'étude des vestiges de l'industrie humaine: L'identification pétrographique des instruments de pierre, par J. F. S. Stone; Les micro-organismes des silex, par A. Laming (avec la collaboration de G. Deflandre); Reconstruction des techniques—la poterie, par H. Balfet—le métal, par A. France-Lanord; Conclusion, par A. Laming; Appendices: Notes bibliographiques et renseignements pratiques; Index.

BMU

161. PEASE, MURRAY. Science backs the art detective. *Art News*, 47 (Mar. 1948), pp. 38–41, 57, illus.

Discusses the application and role of science in the judgment and authentication of works of art. The closing paragraph reads: "But it is always important to remember that scientific instruments are no substitutes for taste and judgment. They are accurate, dependable, and precise, within their proper limitations, but we must know what questions to ask of them. And the answers, at best, are only a part of what we need to know. We can approach the truth only when we have assembled all the evidence, and this evidence must always include wise judgments in the fields of history and connoisseurship, along with the subjective technical data. After assembling our data we must still employ, moreover, discrimination and selection. Each work of art is a complex and unique entity, involving not only the three simple dimensions of space, but others less easily measured and tabulated, such as aesthetic content and existence in time. All of our most important decisions must recognize these intangible as well as the material dimensions."

RJG

162. RAWLINS, FRANCES IAN GREGORY. Methodology of science in the service of the arts. *Nature (London)*, 163 (1949), p. 390.

An examination of the methodology of "Science in the Service of the Arts": the use of laboratory tools cannot answer questions of style and taste; to answer questions of attribution a greater emphasis upon ex-

perimental methods is necessary. Historical development: a study in morphogenesis—paralleling increase in symmetry and increase in beauty. Some axiological considerations lead to the necessity for a new type of administrator with a scientific background and habit of mind. RMO

163. RAWLINS, FRANCIS IAN GREGORY. Natural science and the fine arts. *Roy. Inst. Gt. Brit. Proc.*, 34 (1947), pp. 40-46; *Nature (London)*, 159 (1947), pp. 628-630.

A consideration of the relation between the methodology of science and stylistic knowledge and insight. In this context natural science is auxiliary to the fine arts. The equipment of the National Gallery Laboratory is described and examples are given of the results obtained and their interpretation. SRJ

164. RAWLINS, FRANCIS IAN GREGORY. Scientific research and the art gallery. *Nature (London)*, 169 (1952), p. 264.

An announcement of the establishment at the National Gallery, London, by the Nuffield Foundation, of two graduate scholarships, one in chemistry and one in physics, with an assistant for a period of three years under the direction of F. I. G. Rawlins. The main theme will be the chemistry and physics of diffusion and swelling of paint and varnish films by solvents. The long-range purpose is to establish the optimum conditions for the easy and rapid removal of undesired over-painting and deteriorated varnishes from paintings. RJG

165. RAWLINS, FRANCES IAN GREGORY, and WERNER, A. E. Scientific method and the art gallery. *Science Prog.*, 40 (1952), pp. 585-603; Cf. *C.A.*, 46 (1952), 7340g.

A relative humidity of 58 percent and a temperature of approximately 64° F. are the optimum environment for paintings in order to prevent stresses and strains in the support of wood or canvas and to prevent blisters and flaking of the paint itself. X-ray diffraction studies of the grounds of classical Italian paintings reveal the use of mixtures of anhydrite and gypsum, never plaster of Paris. Sections are devoted to the use, in the study of paintings, of ultraviolet, infrared, densitometry of X-ray films, tintometry, measurement of gloss, identification of pigments by spot tests and by a modified metallographic technique, use of new materials in conservation (e.g., synthetic adhesives in the "transfer" or reattachment of a painting to a new support) and as surface coatings (e.g., synthetic resins), and long-term research on such problems as "cleaning" of paintings and the composition of natural resins.

166. RICHARDSON, E. G. *Physical science in art and industry*, 2d ed. London, The English university press ltd., 1946. 299 pp., illus.

Contents: Physics of locomotion; Communication physics; Physics and pottery; Physics and the culinary arts; Physics on the farm; River hydrology; Physics down the mine; Physics in fine arts and archaeology; Physics of building materials; Architectural physics; Science and the musician; Textile physics; Physics of detection; Index. PC



167. TATUM, R. M. New horizons in archaeology. *Science*, 106 (1947), pp. 97-98.

The advancement of archaeology in the future will depend largely on the application of other sciences, both for the study of materials already collected as well as those newly brought to light. Even the proper removal of certain objects from excavations and their preservation may depend on a knowledge of the composition and properties of ancient materials. Laboratory investigation of objects and materials may be necessary for the proper understanding of discoveries. Of particular interest are applications of statistics and other mathematical tools to the interpretation of archaeological data. ERC

### J. IDENTIFICATION OF FAKES AND FORGERIES

168. BUNT, CYRIL G. E. An exploited genius, Bastianini. *Connoisseur*, 110 (1943), pp. 134-139, 158.

An account of the nineteenth-century Florentine sculptor whose works in the manner of the quattro-cento passed into the market as antiques. Well illustrated with ten reproductions of his works, mostly in the Victoria and Albert Museum. Deals superficially with the ethical question. SRJ

169. COONEY, JOHN D. A re-examination of some Egyptian antiquities. *Brooklyn Mus. Bull.* 11 (Spring 1950), pp. 11-26.

The author lists four types of Egyptian forgeries: (1) Skilled copies or adaptations usually made in Paris or Egypt in the twentieth century, (2) partial forgeries involving the addition of desirable details, produced since the beginning of the nineteenth century, (3) tourist trade forgeries, usually of Egyptian origin, (4) replicas or fine copies, usually made in France in the nineteenth century. During the closing of the Egyptian galleries in 1949 some questioned pieces were carefully examined. Strong light, low magnification, and solvents were found to be the most useful examination tools. Ultraviolet light was of little use when applied to Egyptian antiquities. Six objects that had been extensively restored or altered are discussed with details of their previous histories, examination, alteration, and possible dates of reworking. EHJ

170. COREMANS, PAUL. L'affaire des faux Vermeer. Documents de complément. *Maandblad Beeldende Kunsten*, 26 (1950), pp. 199-203, illus.

Since the fall of 1948 some interesting new discoveries bearing on the well-known van Meegeren forgery case have been made. Most impor-



tant is that "The Last Supper" owned by a private Dutch collector was painted over an old painting of a "Hunting Scene" by A. Hondius. van Meegeren bought this old painting from an Amsterdam art dealer in 1940. The dealer was able to describe the circumstances of the sale and to produce a photograph of the painting. The details of the "Hunting Scene" match details shown by X-rays in the underpainting of "The Last Supper." Secondly, another and earlier "Last Supper" similar to the one privately owned has been discovered in the artist's studio in Nice. This explains certain discrepancies in the evidence in the files of the Dutch Justice. This was painted over a painting of "Children in a Carriage" by G. Flinck. It was not artificially aged. Thirdly, another part (the lower left) of the cut-down stretcher of the "Disciples at Emmaus" was found in the Nice studio. Previously only the cut-out part of the upper right corner was known. RJG

171. COREMANS, PAUL. *Van Meegeren's faked Vermeers and De Hooghs; a scientific examination*. Amsterdam, J. M. Meulenhoff, c1949. 40 pp., col. front., 76 pls.

Contents: Introduction; Methods in the examination of old paintings; Methods applied in the examination of the pseudo-Vermeers and De Hooghs; van Meegeren's working technique; Verification of van Meegeren's technique; (The faked Vermeers and De Hooghs—and history) H. A. van Meegeren's biography and works; History and detection of the forgeries; Psychological aspect of the Vermeer-van Meegeren case; The forgeries—History of art and technique; Esthetic examination of the forgeries; Conclusion; Plates.

Reviewed in: *I.L.N.*, Je. 14, 1950, pp. 62-63, by J. Squire. BMU

172. DEBLAERE, A. Het geval van Meegeren of het laboratorium in de kunstwereld. *Streven (Amsterdam-Bruxelles)*, 3 (1950), pp. 31-40, 3 illus.

Récapitulation des résultats scientifiques obtenus dans l'examen des faux Vermeer. L'objectivité scientifique prime l'impression artistique.

JT

173. DE WILD, A. MARTIN. De Emmausgangers van "Vermeer" een ideale vervalsing? *Olie (Holland)*, n° 11 (1948), 3 pp.

Arguments scientifiques prouvant la modernité des "Disciples d'Emmaüs."

JT

174. DE WILD, A. MARTIN, et FROENTJES, W. De Natuurwetenschappelijke bewijsvoering in het proces van Meegeren. *Chem. Weekblad.*, 45 (1949), pp. 269-277, 7 illus.

Compte rendu de l'expertise scientifique des faux Vermeer et de Hoogh par H. van Meegeren. Méthodes physiques et chimiques; résultats obtenus.

PC

175. ECKE, GUSTAV. Once again *Hui-hsien*, fraud and authenticity of the figurines. *Artibus Asiae*, 15 (1952), pp. 305-323, illus.

Discussion with aid of many detailed photographs of genuine and false early Chinese figurines, mostly from the collection of the Honolulu Academy of Arts. Laboratory studies indicate that the gloss on the objects considered authentic *Hui-hsien* ware must be attributed to lacquer. RJG

176. FELL, H. GRANVILLE. Looting and faking. *Connoisseur*, 114 (1944), p. 54.

Editorial calling for vigilance in regard to the expected restitution under peace terms of works of art looted by the Nazi chiefs. It is alleged that skilfully faked replicas of many valuable and well-known paintings have been prepared. Every use must be made of scientific methods and the specialized reference libraries containing reproductions. SRJ

177. FELL, H. GRANVILLE. The so-called 'French Primitive'; an exposure and a recantation. *Connoisseur*, 117 (1946), pp. 126-127.

An editorial introducing a letter from Martin S. Soria which establishes the identity of an unrecorded French primitive (Bunt: *Connoisseur*, 116 (1945), p. 98) as a fake. Two other works by the same hand are reproduced. SRJ

178. FELL, H. GRANVILLE. The validity of fakes as works of art. *Connoisseur*, 117 (1946), pp. 32-37.

Writing on the theme that fakes which come to be rejected as the result, for example of the testimony of the faker or some anachronisms other than stylistic, the editor of the *Connoisseur* claims that such works are not entirely devoid of merit as works of art. The fact that they are at first accepted by eminent authorities supports this view. An interesting illustrated account of a number of outstanding cases of forgery and copying follows. SRJ

179. Forgery of works of art. (Special issue.) *Mag. Art*, 41 (1948), pp. 162-200, illus.

Contents: Art and forgery, by George Swarzenski; Some notes on fakes, by W. M. Ivins, Jr.; The laboratory detection of fraud, by Sheldon Keck; The stylistic detection of fraud, by Julius S. Held; Paintings, by W. G. Constable and Paul B. Coremans (3 articles); Sculpture, by John D. Cooney and Gisela M. A. Richter (2 articles); Drawings, by Agnes Mongan; Ceramics, by Nathalie Zimmer, Sheldon Keck, and Samuel K. Lothrop (2 articles); Prints, by Una Johnson; The need for objective examination, by George L. Stout; Legal remedies for art forgeries, by Wolfgang S. Schwabacher. BMU

180. Fresco faker; German forges Gothic church art [in the German city of Lübeck painted by Lothar Malskat], *Life*, Jan. 19, 1953, pp. 49-50, illus.

181. FROENTJES, W. The van Meegeren case. The scientific investigation. *Internat. Crim. Police Rev.*, 3 (décembre 1948), pp. 7-15, illus.

Introduction. X-ray examination. Macroscopic and microscopic examination. Chemical and physicochemical examination. Conclusion.  
PC

182. FRONTJES, W., and DE WILD, A. MARTIN. A forged Frans Hals. *Burl. Mag.*, 92 (1950), p. 297 (correspondence).

A Frans Hals in the Groningen Museum (Holland) entitled "A Boy Smoking" was proved to be a forgery when on analysis by partition chromatography the medium was found to be gelatine.  
SRJ

183. GRANCSAY, STEPHEN V. Italian seventeenth century pistols: genuine and false. *J. Walters Art Gallery*, 11 (1948), pp. 62-75.

The author discusses in some detail a brace of North Italian snap-haunce pistols from the Walters Gallery and a brace of Brescian flint-lock pistols from the Metropolitan Museum. It is believed that they were damaged by fire and skilfully restored. Since the artists' names have been forged on the locks of one from each set, these two pistols may be termed forgeries. The author points out the importance of studying the mountings of a pistol, piece by piece. The production methods of such pistols are discussed (different craftsmen worked on the separate parts of a pistol), as well as the mechanisms and history of the craft. Distinguishing genuine from false is primarily a question of a thorough familiarity with all kinds of workmanship and an ability to appraise the ensemble as well as the details.  
EHJ

184. The greatest art sensation of the decade; the authenticity of Vermeer's "Christ at Emmaus" challenged. *ILN.*, 207 (1945), pp. 500-501.

A short article, mainly nontechnical, with six photographs.  
MB

185. HIND, ARTHUR M. Drawings by Brabazon. *Burl. Mag.*, 88 (1946), p. 24.

Letter calling attention to the existence of a large number of forged drawings by H. B. Brabazon.  
SRJ

186. HODGSON, MRS. WILLOUGHBY. A Shakespearean forgery. *Apollo* (London), 37 (1943), p. 12.

An account of a forgery by William Henry Ireland (1777-1835) in the form of a painting of the Globe Theatre done on an old piece of parchment.  
SRJ

187. HOURTICQ, LOUIS. *L'amateur de peinture*. Paris, Librairie Floury, 1945. 124 pp.

Contents: L'appel de la peinture; Le jeu des attributions; Graphologie et iconographie; De l'original au faux en passant par la réplique et la copie; Restaurations et retouches; L'art et la rhétorique; Amateurs et collectionneurs; La peinture et la richesse; De saint Luc à Ambroise Vollard; La survie.  
BMU

188. IVINS, WILLIAM M., JR. Ignorance, the end. *B.M.M.A.*, n.s. (1943/-44), pp. 2-10, illus.

The author discusses the statement that while a forger can fool his contemporaries he cannot fool his grandsons because he builds into his handiwork the contemporary ideas of how an old object should look. The point is illustrated by 10 engravings made over a period of 400 years and two photographs by different men of the head of the Laocoön, each version being quite different. As the same object appears differently to men of different nationalities and eras, so we cannot know what was the true "original condition" of an art object. There is little ultimate difference except in original intent between museum restorations and skilful forgery. Restoration is the willful alteration of an object to put it in a condition we prefer to that in which we found it, and our practice in this respect is illogical. The author points out the philosophical difficulties in the study of art and decides it is best not to think about such problems. EHI

189. KURZ, OTTO. *Fakes, a handbook for collectors and students*. London, Faber and Faber, Ltd., 1948. 329 pp. +95 illus.

Contents: Preface; Painting; Classical paintings and mosaics; Illuminated manuscripts; Drawings; Prints; Stone sculpture; Terra-cotta; Sculpture in wood; Ivory carvings; Bronze sculpture; Chinese bronzes; Goldsmiths' work; Pottery and porcelain; Glass; Furniture; Tapestries; Bookbindings; Fakes without models; Conclusion; Index.

Reviewed in: *Mag. Art*, 41 (1948), p. 320, by Sheldon Keck. BMU

190. LEERINCK, HANS. In de werkplaats der kunstvervalsers. *Phoenix (Amsterdam)*, 2 (1947), pp. 42-48.

Généralités sur les faux en art et archéologie.

PC

191. LE MAY, REGINALD. Modern imitations of early stone sculpture from Siam. *Burl. Mag.*, 82 (1943), pp. 10-14; Modern imitations of early bronze sculpture from Siam. *Ibid.*, 83 (1943), p. 197.

Illustrated accounts of modern forgeries made by craftsmen in Siam, one of whom the author visited in his workshop. Apart from the solubility of the patina the criteria are entirely stylistic. SRJ

192. LIDDELL, DONALD M. Counterfeit Flaxman chessmen. *Antiques*, 48 (1945), pp. 276-277.

An incomplete set of chessmen purporting to be those designed by Flaxman and first produced by Wedgwood in 1783 appeared on the New York market. They were unmarked and in white and blue of hues unlike true Wedgwood. Comparison with genuine chessmen ascribed to 1783 and a new set made from the original molds revealed discrepancies in size (the counterfeit ones were 8 to 12 percent smaller than the originals) and in various details of modeling. It is presumed that either pressings were taken of true Flaxman chessmen or they were modeled from the original figures and the smaller size resulted from the shrinkage caused by the firing of the imitation figures. EHI



193. LOPÉZ-REY, JOSE. A twentieth century forger of Goya's works. *Gaz. Beaux-arts*, 34 (1948), pp. 107-116, illus.

Discussion of two works (one drawing and one painting) spuriously given Goya's name. PC

194. MALINGUE, MAURICE. Les faux tableaux. In Gauguin, Paul. *Gauguin, le peinture et son oeuvre*. Paris, Les Presses della Città, 1948, pp. 66-70.

195. PANOFSKY, ERWIN. Dürer's last picture? *Burl. Mag.*, 89 (1947), pp. 55-63.

In an article on an unpublished painting which the author considers to be by Dürer reference is made to revelations made during the cleaning process: a cross-staff held in the right hand "dissolved under the action of the cleaning fluid." SRJ

196. PLENDERLEITH, HAROLD JAMES. Fakes and forgeries in museums. *M. J.*, 52 (1952), pp. 143-148.

A paper read at the Museums Association Conference at Oxford in July 1952, to coincide with the opening of an exhibition of "Forgeries and Imitations" at the Ashmolean Museum. Many examples are cited showing instances where the scholar and the scientist have worked effectively as a team in detecting forgeries. RJG

197. REISNER, ROBERT GEORGE. *Fakes and forgeries in the fine arts; a bibliography*. New York, Special libraries association, 1950. 58 pp.

This compilation lists 859 titles, including books, sections of books and articles, and covers by sections all the important classes of art. "It furnishes the scholar, the museum curator with a record of books and periodical literature published from 1848 to 1948." In addition, there is a long bibliography of articles from the *New York Times*, 1887 to the present. Author index. BMU

198. RIGBY, DOUGLAS, and RIGBY, ELIZABETH. Buyers beware! Chapter 18 in *Their Lock, stock and barrel; the story of collecting*. Philadelphia, New York, London, Lippincott company, c1944, pp. 417-440, plates.

RJG

199. ROE, F. GORDON. From true to false; restoration v. forgery in woodcraft. *Connoisseur*, 117 (1946), pp. 95-102.

The article opens with a plea for the creation of a "Hall of Fakes." A permanent exhibition of this type would be of great service to scholars as well as the public. The author then proceeds to illustrate the distinctions between forgery, legitimate restoration, and reproduction in the case of woodcraft. Ten examples are reproduced. SRJ

200. RORIMER, JAMES J. Forgeries of medieval stone sculpture. *Gaz. Beaux-arts*, 26 (1944), pp. 195-210, illus.



The author discusses some characteristics of forgeries and techniques of forgers. NLB

201. RUDOLPH, RICHARD CASPER. Dynastic booty; an altered Chinese bronze. *H.J.A.S.*, 11 (1948), pp. 174-180, illus.

A Chinese bronze bell of the type *chung* 鐘 or *po* 罍 in the Royal Ontario Museum of Archaeology in Toronto bears two inscriptions; on one side are two original characters which are cast; on the opposite side the original characters were chiseled away in ancient times and two new characters were crudely incised into the surface. From literary evidence it was learned that "the original inscription on the altered side of the bell was Ta-shêng 大晟. It was removed and replaced with the present inscription by court officials in 1174 because it violated the personal name of a former Chin ruler. The bell was cast in all probability in the year 1105 or 1104. RJG

202. SCHEDELMANN, HANS. Konrad fecit; the story of a remarkable forger. *Connoisseur*, 122 (1948), pp. 8, 13, 55.

An illustrated account of the works of Anton Konrad, "one of the most ingenious forgers of arms and armour who has ever existed." Konrad died in 1938. His work passed through the leading salesrooms and found its way into several important collections. SRJ

203. SHORTT, HUGH DE S. *Detection of coin forgeries in North-west India*. London, L. S. Forrer, 1950. 11 pp.

The difficulty of detecting forged Indo-Greek coins, especially in the field is pointed out by an illustration concerning two tetradrachms of Hermaios which were seized from the forger while still hot in the molds. These coins were regarded as genuine by British authorities. Shortt discusses and finally tabulates twenty characteristics—referred to their occurrence in genuine coins and in forgeries of various types both ancient and modern. RMO

204. STEINDORFF, GEORGE. Fakes and fates of Egyptian antiquities—a supplement to the catalogue of Egyptian sculpture. *J. Walters Art Gallery*, 10 (1947), pp. 52-59.

The faking of Egyptian antiquities goes back to the first decades of the nineteenth century. The earliest fakes were so poor that they were readily recognized as forgeries. Sometimes new inscriptions have been added to genuine pieces in order to enhance their value. There are a large number of forgeries sold every year, some of them very cleverly done. Some of the centers for the production of such forgeries have been located. The author appends new information about pieces in the Walters collection which has been received following the publication of the catalogue of Egyptian sculpture. EHJ

205. TIETZE, HANS. *Genuine and false; copies, imitations, forgeries*. New York, Chanticleer press inc., 1948. 80 pp. incl. 73 reproductions in color and monochrome.

Contents: Forgeries were made at all times; The counterfeiter's weapons; The expert's countermeasures; The forger's triumph; The forger's unmasking and condemnation; Conclusion. BMU

206. U. S. Treasury dept. Secret service division. *Know your money*. Washington, D. C., Govt. print. off., 1948. 32 pp. illus.

Contents: How to know counterfeit money; What to do about it; How to guard against forged government checks. BMU

207. WALKER, RAINFORTH ARMITAGE. *How to detect Beardsley forgeries*. Bedford, R. A. Walker, 1950. 31 pp. incl. 7 pls.

Contents: Beardsley forgeries; Published drawings; Unpublished drawings; Appendix. BMU

208. WIJDE, INGE, *pseud.* *Kluchten en drama's in de kunsthandel*. 2d ed. Leiden, Uitgeversbedrijf van Wetenschappelijke Uitgaven N.V., 1944. 110 pp., pls., illus.

Contents: Inleiding; Waarin duidelijk blijkt, dat de Nederlanders een kunstminnend volk zijn, want ziet ze maar eens sjouwen!; De "Kitsch,"—Waarin Mijnheer N. een schilderstuk van Jaap Daris kocht, hetwelk zijn vriend R. reeds bleek te bezitten, echter met één kip meer, en van een kunsttentoonstelling, waar bijna niets verkocht was; Van een kijkdag, waar men een giraffennek moet bezitten om te kunnen kijken en van een koopman, die een schilderstuk niet goedkoop kwijt raakte, maar wel duur; Van een verzamelaar, die 3 Rembrandts had en er geen nieuwe meer bij nam, en van een ander, die een gesmokkelde Jan Steen kocht, die geen Jan Steen was; Van een Rembrandt die geen Rembrandt en toch weer wel een Rembrandt was, toen een Rubens werd, waar een v. Dijck onderuit kwam en nu weer een ? is; Van een expertise, die niets waard was, van een, die zeer veel waard was, en van een schilderij zonder expertise, dat nog meer waard was; Restauratie en restaurateurs. . . . ; Van een fabrikant-philantroop, die met een penseel een goudmijn exploiteerde en bijtijds de doos insprong; Van een collectie Haagsche School, die geen collectie was, en van een Mauve voor f 9,50, die men terugbracht, omdat hij te echt was!; Van een erfgenaam, die geen erfgenaam was, en een particulier, die geen particulier was; Van een mijnheer, die een Mauve kocht en hem niet nam, omdat het een Ter Meulen was, en van een ander, die van de "Franschen" hield, een bijzonder mooie kon kopen, doch hem liet gaan, omdat . . . het een Hollander was!; Van een middenstander, die een "Kunsthandel" opzette en met een "puinhoop" eindigde!; Van een wijnhandelaar, die het "bekeken" had en een Mesdag, waarvan je de zee kon ruiken . . . ; Twee dagen uit het leven van een kunsthandelaar; Van een amateur-expert, die met een speld, een "critisch oog," een sterrenkijker, zijn nagels en zijn "kennis" de kunst dient . . . ; Van een Potter uit Java, twee ouderwetsche Ten Kate's, een "Prent" en de "Rembrandt-man."; Een pleidooi voor de kunst en een veroordeeling van de klungels; Slot; Plates. BMU

209. WOODWARD, ARTHUR. Mexican pottery faking. *Los Angeles Co. Mus. Q.*, 7 (Fall 1948), pp. 13-18, illus.

Informal discussion of faking in objects of pottery, gold, copper, obsidian, hard stone, and native paper going back to the early 19th century. RJC

210. YATES, RAYMOND FRANCIS. *Antique fakes and their detection*. New York, Harper & brothers, 1950. x, 229 pp., illus.

Contents: What is a fake?; The economics of fraud; The black market for fakes; The glorified antique; Detecting furniture frauds; Hardware as a guide to age; The problem of restoration; The growing problem of reproductions; Beware of glassware; Cheating in china-ware; Silverware and Sheffield plate; Fakes in pewter; Fakes among the timepieces; Fake antique jewelry; Lamps and lighting fixtures; Silhouettes, profiles and miniatures; Old prints and paintings; Fakes and reproductions in cast iron and brass; Protection for the buyer; Index. BMU

## MATERIALS, CONSTRUCTION AND CONSERVATION OF OBJECTS

### A. STONE, BUILDING STONE, AND STONE ARTIFACTS

211. ARKELL, ANTHONY J. L'avenir de la construction en pierre en Angleterre. *Endeavour*, 9 (1950), pp. 40-44.

Un nouvel essor pourrait être donné à la construction en pierre en Grande-Bretagne, par l'intervention de la science dans le choix judicieux des pierres. FD

212. BADEN-POWELL, D. F. W. Experimental Clactonian technique. *P.P.S.*, 15 (1949), pp. 38-41.

Experiments in making Clactonian flint cores and flakes. IG

213. BADEN-POWELL, D. F. W. High-angle edge flaking of flint. *Nature (London)*, 152 (1943), pp. 663-664.

Taking adjacent flake series as a criterion of intentional production, specimens from the Miocene age are held not to be natural. LB

214. BADEN-POWELL, D. F. W., and REID MOIR, J. New Palaeolithic industry from East Anglia. *Geol. Mag.*, 79 (July/Aug. 1942); Research item in *Nature (London)*, 151 (1943), p. 26.

A summary of characteristics of flint implements from Corton, Hoxne, and Runton in Norfolk, indicating methods of production. LB

215. BARNES, ALFRED S. High-angle edge flaking of flint. *Nature (London)*, 152 (1943), p. 477.

Gun-flint knappers use angles of 120-150°, although they employ an iron hammer and anvil. Out of the 1800 measured, only 1.1 percent of the angles on ancient artifacts exceed 110°, and only 18 percent (maximum of several series) exceeded 90° the rest being acute. Eocene flakes show 54-62 percent of angles above 90°; Tertiary flakes 62-70 percent; thus the latter are classed with the former, where human agency is ruled out by age, and are thought to be due to soil movement under pressure. LB

216. BARNES, ALFRED S. The technique of blade production in Mesolithic and Neolithic times. *P.P.S.*, 13 (1947), pp. 101-113.

Flint and other materials used for the tools, early accounts, preparation of the platform and use of anvil, etc. IG

217. BARNES, ALFRED S., BURY, H., and BADEN-POWELL, D. F. W. High-angle edge flaking of flint. *Nature (London)*, 153 (1944), pp. 226-227.

Further to previous correspondence (*Ibid.*, 152 (1943), pp. 663-664), the criterion of intentional production is considered to fail in the case of Eocene specimens. Cores with angles near 90° are in their "reject" stage, acute-angle flaking being easier. No correspondence between age and content of obtuse angles is evident.

This is refuted: recrudescences of rough work being admitted, no early industry shows a low number of obtuse angles.

Although occasional resemblances may be found, there are essential differences between Eocene specimens and those of a later date described as eoliths. Steep flaking cannot be taken as a criterion of intentional work. LB

218. BIXBY, LAWRENCE B. Flint chipping. *Amer. Ant.*, 10 (1944-45), pp. 353-361, pls.

The author relates how he taught himself to make arrowheads and other simple artifacts from stone by the process of flaking employed by primitive man. Materials, tools, and methods of working are described with illustrations. RJG

219. BLAKE, MARION ELIZABETH. *Ancient Roman construction in Italy from the prehistoric period to Augustus*. A chronological study based in part upon material accumulated by Esther Boise Van Deman. Washington, 1947. 421 pp., plates. (Carnegie Institution of Washington. Publ. 570).

Contents: List of plates; Selected bibliography and abbreviations; Types of evidence; Roman building materials; Stone walls in Italy;



Squared stone construction in cut-stone work; *Opus incertum* and *opus reticulatum*; Sun-dried and semi-baked bricks; Brick and tile construction; Mortar and similar mixtures; Concrete; Indexes: A. Sites other than Rome; B. Rome; C. Types of evidence; D. Materials used in building; E. Subjects; Plates.

Reviewed in: *Nature*, 162 (1948), p. 755, by Joan Liversidge.

220. BOM, J. A. L. *Natuursteen bij historische bouwwerken*. *Bull. Kon. Ned. Oud. Bond*, 6th ser., 3 (1950), pp. 162-186, 25 illus.

Les pierres de construction utilisées en Hollande; origine géographique, description, importance, exemples d'utilisation. Une description détaillée des outils utilisés pour la taille. FD

221. BOTHMER, BERNARD V. Two heads of the New Kingdom. *B.M.F.A.*, 47 (1949), pp. 42-49.

A dark gray granite head is identified on the basis of style and facial resemblance as Amenhotep Son of Hapu, a distinguished official of Amenhotep III. Its size and material suggested that it may have belonged to one of two now headless statues of this subject. Another head in quartzite is identified as the Chief Steward in Memphis, Amenhotep, who lived in the time of Amenhotep III. The material and indications of the costume suggested spectrographic and petrographic comparisons with a headless statue of the same subject, now in the Ashmolean Museum. The tests indicated that the two pieces originated in the same quarry and in particularly close vicinity to each other. A section of the two spectrograms is illustrated, showing their great similarity. EHJ

222. BOURCART, J., NOETZLIN, J., POCHON, JACQUES, and BERTHELIER, MLLE. S. Étude des détériorations des pierres des monuments historiques. *Ann. inst. tech. bâtiment et trav. publ.*, n.s. no. 108 (Dec. 1949), pp. 1-16, illus.

A systematic study has been made of a type of decay frequently found in stone buildings in Western Europe. The decay results from the conversion of calcium carbonate to calcium sulphate. It affects especially the calcareous mass that binds together the calcite crystals in stone. The sulphuric ions in rainwater are rarely directly responsible for decay. There must be an accumulation of water saturated with salts. Attack is aided by an aerobic bacteria which is oxidizing and autotrophic. A series of experiments which were made with the aim of verifying the different phases of the mechanism are described and numerical data are given. RJG

223. BRANDI, CESARE. Nota sui marmi del Partenone. *Boll. ist. centrale restauro*, 3-4 (1950), pp. 3-8.

Une étude de marbres d'Elgin montre qu'un récent grattage des surfaces a eu pour conséquence d'enlever la patine et l'enduit original qui les recouvraient. FD



224. BURY, H. High-angle edge flaking of flint. *Nature (London)*, 152 (1943), p. 664.

Natural flaking agencies are thought to have been far more active in the Pleistocene era. Figures given by Barnes (*ibid.*, p. 477) in support of natural formation are re-interpreted in terms of development of human skill. Further references are given and Barnes's conclusions are regarded as premature. LB

225. CAMERMAN, CHARLES. Un aspect de la collaboration du chimiste à l'activité de l'ingénieur-civil des constructions. La défense contre les méfaits de l'ion  $\text{SO}_4$ . *Bull. Centre Etudes*, 4 (1929), 34 pp., illus.

Description du cycle du soufre; Danger des sulfates dans le sol, dans les nappes aquifères et dans l'atmosphère; Altération des briques; Conseils généraux. FD

226. CAMERMAN, CHARLES. Étude des pierres des monuments bruxellois; leur altération par les fumées. *Bull. soc. belge géol. paléontol. et d'hydrol.*, 54 (1945), pp. 133-139, pls.

Mechanism of alteration of natural building stones and especially of limestone by the action of coal fumes and water. Effects on several old buildings of Brussels.

Reviewed in *Bull. Musées Roy. d'Art d'Hist., Bruxelles*, 3<sup>a</sup> ser., 17 (1943), p. 93. PC

227. CAMERMAN, CHARLES. La pierre de Tournai; son gisement, sa structure et ses propriétés.—son emploi actuel. *Mém. soc. belge géol., paléontologie hydrologie*, n° 1 (1944), pp. 5-86, 4 pl.

Lithologie; Description géologique du gisement; Emploi des pierres de Tournai—Désignation des pierres utilisées en construction; Gélivité du calcaire de Tournai; Description détaillée des carrières intéressées à la production des pierres de construction; Résumé et conclusions; Notice bibliographique; Planches. FD

228. CAMERMAN, CHARLES. Sur les cas d'altération des pierres de taille par les fumées. *Ann. inst. tech. bâtiment trav. publ.*, n° 14 (1948), pp. 1-18, 14 illus.

Introduction: La lutte contre l'altération des pierres de taille par les fumées. Les principes généraux de la sulfatation des pierres par les fumées. L'examen objectif des pierres de taille calcaires les plus répandues des bassins franco-belges. Conclusions: Sensibilité aux fumées des différents types de roches calcaires—pierres dont l'emploi est recommandé dans les centres urbains et industriels. Réflexions au sujet de la gélivité. FD

229. COREMANS, PAUL B. L'altération et le traitement des calcaires égyptiens infectés de sels solubles. *C.E.*, 22 (1947), pp. 119-122.

Mechanism of the alteration of Egyptian sculpture in limestone containing soluble salts. Appropriate treatment. PC

230. DAVEY, N. Building materials in antiquity. *Chem. & Ind.*, no. 3 (1950), p. 43.

The building materials discussed include stone, mud, gypsum, lime mortar, and bitumen. Information concerning their use in antiquity has been drawn from these sources: (a) contemporary drawings, sculptures, and inscriptions; (b) recent excavations; and (c) primitive techniques still in operation. The technique used in Roman times of mixing mortar and sieving the ingredients are described. AEW

231. FRERE, S. S. Axe-hammer from Loddon. *Norfolk Ant. J.*, 23 (1943), pp. 154-155.

Dr. Phemister reports "the axe is composed of basalt in which there is an abundance of pyroxene pigeonite and a small amount of interstitial quartz." Thus the affinities of the axe lie across the North Sea and it is possibly an import from Scandinavia. IG

232. GIOT, P. R. A petrological investigation of Breton stone axes. *P.P.S.*, 16 (1950), p. 228. IG

233. GOODMAN, MARY ELLEN. The physical properties of stone tool materials. *Amer. Ant.*, 8 (1943/44), pp. 413-433, pl., tables.

The difficulties of defining the physical properties of the stone materials used by primitive man for tool and weapon making are discussed. ". . . Such terms as hardness, toughness, and resiliency are but blanket labels generally understood to cover a complex of characteristics that can be made manifest only by doing something to the material." Values are tabulated for measurements of density, hardness (Rockwell and Shore Monotron), resiliency (Shore Scleroscope), and toughness (Paige Impact Tester) on limestone, silicified tuff, obsidian, quartzite, chert, fossil wood, and various kinds of flint. RJG

234. GULINCK, M. Oude natuurlijke bouwmaterialen in Laag- en Midden-België. *Tech. Wetenschap. Tijd.*, 18 (1949), pp. 25-32, 2 cartes.

Propriétés, gisements et mise en oeuvre des roches utilisées jadis dans la construction des monuments anciens et provenant des dépôts quaternaires et tertiaires. RL

235. HOCKMAN, ARTHUR, and KESSLER, DANIEL W. Thermal and moisture expansion studies of some domestic granites. *J. Res. Nat. Bur. Stand.*, 44 (1950), pp. 395-410.

Expansion coefficients of 48 samples of domestic granites averaged  $6.2 \times 10^{-6}$  per deg. C. Moisture expansion, upon saturating specimens with water, averaged 0.004 percent. Relation of these facts to weathering of granite briefly discussed. RLF

236. KAUFFMANN, JACQUES. Role of nitrifying bacteria in the alteration of the calcareous stone of monuments. *Compt. rend.*, 234 (1952), pp. 2395-2397; *C.A.*, 46 (1952), 8706b.

The calcareous stone is attacked by nitrifying bacteria by using carbonate as a source of C, and also by the  $\text{HNO}_2$  and  $\text{HNO}_3$  formed from the air by these bacteria. The salts are washed away by the rains.

237. KNOWLES, Sir FRANCIS H. S. *The manufacture of a flint arrow-head by quartzite hammer-stone*. Oxford, 1944. 36 pp., illus. (Pitt Rivers museum. University of Oxford. Occasional papers on technology, I).

Types of flakes used, processes involved in the manufacture. Quartering, flaking the core, percussion, and pressure flaking. IG

238. LIBERTI, SALVATORE. Sui marmi del Partenone. *Boll. ist. centrale restauro*, 5-6 (1951), pp. 5-8.

L'examen microscopique d'échantillons de marbres ayant pour objet la détermination des restes d'un enduit ancien. FD

239. MARINOS, GEORGE P. Notes on the structure of Greek marbles. *Amer. J. Sci.*, 246 (1948), pp. 386-389, illus.

Most of the marbles used in Greek antiquity for sculptures and architectural works came from southeastern Greece, and the Aegean islands. There are some structural differences which make it possible to recognize the degree of metamorphism and hence the origin of the marbles. The standard Parian marble is made of equant calcite grains,  $\frac{1}{2}$  mm. in diameter. This arrangement is the reason for the great transparency of this rock. In best Pentilikon marble the texture is formed by grains of unequal size, which causes decrease in transparency. Some of the less altered rocks contain remnants of fossil Foraminifera. Bibliography. RJG

240. MOREY, JUNE E. Petrographical identification of stone axes. *P.P.S.*, 16 (1950), pp. 191-193. IG

241. MORTON, E. Preserving stone structures. *J. Incorp. Clerks of Works Assoc. Gt. Brit.*, 59, no. 712 (1942), pp. 88-90; *B. P. V.*, 16 (1943), p. 53; *Abstract Review*, no. 83 (1943), p. 133.

Ideal preservatives penetrate the porous surface adequately and uniformly, do not stain or react with it, and have a similar coefficient of thermal expansion. While giving a water-repellent finish they should not seal moisture inside the stone. Oil paints have insufficient life because of aging characteristics; deposition of preservatives in the pores by metathetic reaction is possible but impractical.

242. PENN, WILLIAM S. Silicic ester plastics. *Australian plastics*, 2, no. 23 (1947), pp. 36-38, 40-43; *C.A.*, 42 (1948), 8021g.

The most important silicic ester is Et silicate. Typical applications are as a binder for refractory materials to make moldings and as a

hardening agent for plaster of Paris, sand, stone, etc. Typical trade names are Silester O (Et silicate), Kexacrete (a siliceous liquid), and Silesters 1 and 2 (partially hydrolyzed liquids). These commercial products are discussed as well as the making of a Silester mold, mold filling and stripping, air drying and baking, mold surface hardening, patching lubricant, casting, and suitable mixtures.

243. POCHON, JACQUES, ROSE, ADOLPHE, and TCHAN YAO-TSENG. Formation of gypsum, from a biological viewpoint, in certain deteriorations of the stones in monuments. *Compt. rend.*, 228 (1949), pp. 438-439; *C.A.*, 43 (1949), 4727b.

Inoculation of stones (containing small amounts of  $H_2S$ ) with certain bacteria, capable of oxidizing  $S^{--}$  and  $S_2O_3^{--}$  to sulfate, followed by slow drying of the cultures produced a material which gave X-ray spectrum of crystallized gypsum. The latter was not formed in the absence of  $H_2S$ .

244. POCHON, JACQUES, COPPIER, O., and TCHAN YAO-TSENG. Role of bacteria on alterations of stone monuments. *Chimie et industrie*, 65 (1951), pp. 496-500; *C.A.*, 45 (1951), 8080b.

It is postulated that sulfates are reduced to sulfides by anaerobic *Desulfovibrio* and *Clostridium* species in the soil below the foundation. The sulfides move up the monument by capillarity, and are oxidized to sulfate by aerobic *Thiobacillus* species. Experiments in the laboratory support this theory.

245. POCHON, JACQUES, and TCHAN YAO-TSENG. Role of microorganisms in the alteration (called "disease of stones") of the front of Paris monuments. *Compt. rend.*, 223 (1946), pp. 695-696; *C.A.*, 41 (1947), 2117a.

One of the most frequent types of alterations seen on city monuments is an exfoliation of the superficial "calcin" layer, which swells, then comes off, leaving a fine yellowish-gray powder. The amount of gypsum in the injured parts is considerable. Many hypotheses have been given to explain the formation of  $CaSO_4$ . City atmospheres are rich in  $SO_2$ , less rich in  $SO_3$ , and, in Paris, contain traces of  $H_2S$ . The oxidation of  $SO_2$  into  $SO_3$  occurs in the atmosphere under rays of the sun, and it could be that "calcin" may play a catalytic role in this reaction. Salt solutions containing N in ammoniacal form and S as sulfite,  $FeSO_4$ , or  $H_2SO_4$  thus formed which attacks the stone. Also the  $Na_2S_2O_3$ , and also silica gel plaques impregnated with saline solution containing  $Na_2S_2O_3$  were used as media. To all were added pulverized particles of the sick stone taken from Notre-Dame-de-Paris. No cultures were obtained with media containing  $SO_2$  or  $S_2O_3$ ; however, in  $H_2S$  media an immobile, gram-neg., aerobic cocco-bacillus was found. It uses N in the forms of  $NH_3$ ,  $NO_3$ , and  $NO_2$ , but S only in the  $H_2S$  form, which it oxidizes to  $SO_3$ .



246. POCHON, JACQUES, and TCHAN YAO-TSENG. Role of sulfur bacteria in the disintegration of building stone. *Compt. rend.*, 226 (1948), pp. 2188-2189; *C.A.*, 44 (1950), 8413b.

Bacteria, which are capable of oxidizing dithionites to sulfates, are isolated by extracting damaged stone with a saline solution containing traces of S; N is provided in form of  $\text{KNO}_3$ . Flasks are charged with saline solution of Winogradsky, 3.6 g. of  $\text{KNO}_3$  per l., and bits of sound stone. Some flasks are sterilized and some are not, and some are inoculated with the bacteria. Air, with or without small amounts of  $\text{H}_2\text{S}$ , is bubbled through all flasks. After one month it is shown that only those inoculated flasks, through which air and  $\text{H}_2\text{S}$  had been bubbled, were acid. The pH of flasks without  $\text{H}_2\text{S}$  and with bacteria and with  $\text{H}_2\text{S}$  and without bacteria, was unchanged. These findings appear to support the hypothesis that these bacteria play a role in the disintegration of stone.

247. QUERVAIN, F. DE. The effects of weathering agents on building stone in Switzerland. Pt. I. *Beit. Geol. Schweiz. Geotechn. Ser.*, 23 (1945), 56 pp.; *C.A.*, 40 (1946), 6027.

A general discussion, illustrated by 82 photographs, of the weathering of building stones in Switzerland. Part II will contain data on the physical and chemical changes during weathering. The effects caused by various agents such as ground moisture, atmospheric gases such as  $\text{SO}_2$ , or frost, are discussed. The physical forms of weathered surfaces (scaling, sanding, cracking, etc.) are described and illustrated. Surface incrustations, especially of gypsum and sulfates of Na and Mg, are described. Generalizations are given of the resistance of various types of Swiss rocks used in buildings to weathering processes.

248. QUERVAIN, F. DE. The effects of weathering on building stones. *Mitt. naturforsch. Ges. Bern* [n.f.], 8 (1951), pp. v-vi; *C.A.*, 46 (1952), 1732g.

Physical and chemical factors are discussed. In cities the physical effects of soluble salts such as  $\text{NaCl}$ ,  $\text{Na}_2\text{SO}_4$ , and  $\text{MgSO}_4$  are important in breaking down building stones.

249. REID MOIR, J. High-angle edge flaking of flint. *Nature (London)*, 152 (1943), pp. 78-79.

Production of flakes 1-2 inches long and wide (maximum) at angles of 100-140° between striking platform and residual scar on parent block, using a quartzite hammer head.      LB

250. ROLLAND, PAUL. La pierre de Tournai. Son emploi dans le passé. *Mém. soc. belge géol., paléontologie hydrologie*, n° 1 (1944), pp. 87-118, 10 illus.

Prodromes; Apogée; Débouchés géographiques, Formes en architecture religieuse, en architecture publique civile et architecture domestique; Décadence.      FD



251. SHAW, C. T. Report on excavations carried out in the cave known as 'Bosumpra' at Abetifi, Kwahu, Gold Coast Colony. *P.P.S.*, 10 (1944), pp. 1-61.

Material employed in making celts, p. 36; The making of celts, p. 44; Making of biconically pierced stones. IG

252. SOFIANOPOULOS, ATHANASIOS J. The porous stones of the Acropolis. *Prakt. Akad. Athenon*, 15 (1940), pp. 260-269; *C.A.* 46 (1952), 4440d.

Comparison of ancient quarries of Actium and Piraeus, with theories for the dolomitic formation due to partial substitution of Mg for Ca in  $\text{CaCO}_3$  deposits. The chem. alteration was more advanced in the surface layers, becoming less evident with increasing depths, the  $\text{CaCO}_3$  percentage increasing with samples from lower beds. Thus analyses of stones in the Acropolis give evidence of  $\text{SiO}_2$  infiltration and formation of silicate coverings of the deposits.

253. SOFIANOPOULOS, ATHANASIOS J. Soft stones in the Acropolis. *Prakt. Akad. Athenon* 15 (1940), p. 196-205; *C.A.*, 46 (1952), 4440e.

Foundations of the Acropolis are either Hymettian limestone or Piraeus dolomite as judged from similarities of grain, color, and general appearance. The first are of much more ancient design, used long before the dolomitic in the oldest Acropolis monuments. S. describes petrographical features, chemical components, natural local measures used for mortar, theories for the coloration, and the ancients' reasons for choice of materials.

254. Southwestern group of museums and art galleries. Sub-committee. Reports on the petrological identification of stone axes. *P.P.P.* (First report), 7 (1941), pp. 50-72; by Alexander Keiller, Stuart Piggott, and F. S. Wallis; (Second report) 13 (1947), pp. 47-55, and (Third report) 17 (1951), pp. 99-158, by F. S. Wallis and J. F. S. Stone. IG

255. VAN TASSEL, RENÉ. Une efflorescence d'acétate chlorure de calcium sur des roches calcaires dans des collections. *Bull. Mus. Roy. Hist. Natr. Belg.*, 21 (Dec. 1945). 11 pp.

A white crystalline efflorescence observed on lime rock specimens in the Museum of Natural History at Brussels was found to be a double salt corresponding to the formula  $\text{CaCl}_2 \cdot \text{CaAc}_2 \cdot 10\text{H}_2\text{O}$ . The fine fibrous colorless needles of this salt are 0.03 to 0.16 mm. in thickness and occasionally reach a length of 3 cm. The rock specimens had been kept for several years in flat oakwood cases with glass tops. Internal volume of the case was 0.03m<sup>3</sup>. Even after dry removal of the crystals they reappeared after a few months. The salt is soluble in water. Analysis gives Ca 17.6%, Mg trace, Cl 15.4, Ac 25.5,  $\text{H}_2\text{O}$  39.5 (total,

98.0). Microscopically the crystals show low relief and high birefringence; they show parallel extinction and appear to have rhombic symmetry. Indices of refraction measured in Na light are  $\alpha=1.468$ ,  $\beta=1.484$ ,  $\gamma=1.515$ . Elongation is positive and  $c=\gamma$ ; Angle  $2V_{Na}$  (determined on Federoff stage) is  $+80^\circ$ . On the other hand, synthetic calcium chloro-acetate has different optical properties and is monoclinic. Analysis of the soluble salt extracted from the rock interior shows molecular proportions  $Ca:Cl:Ac=1:1.7:0.4$ , while that in the salt efflorescence  $=1:1:1$ . The acetate constituent then appears to be concentrated on the rock surface. Since this efflorescence does not appear when the specimens are stored in glass vitrines, but only in wooden cases it is suggested that the acetate ion originates from the wood. The author proposes the name *calclacite* for this efflorescent salt. RJG

256. VENDL, ALADÁR. Weathering of stones and its prevention. *Természetud. Közlöny*, 75 (1943), pp. 9-20; *Chem. Zentr.*, Pt. 2 (1943), p. 359; *C.A.*, 39 (1945), 171<sup>e</sup>.

The weathering of stones on buildings is shown by many examples. Both the chemical and physical processes have to be considered in the prevention of damages.

257. VULOVIĆ, VERA. The formation of saltpetre on walls and its removal. *Rec. Trav. Protect. Mon. Hist.*, 2 cahier 1 (1951), pp. 59-62.

The cause of calcium nitrate efflorescences at the monastery of Sopoćani was determined chemically and treatment recommended. NLB

258. WEATHERHEAD, A. V. *Petrographic micro-technique; a practical handbook for the preparation of thin sections of rocks for use with the petrological microscope*. London, Arthur Barron Ltd., 1947. 98 pp., 94 illus.

Contents: Introduction; Preliminary treatment; Preparation of thin sections; Thin sections; Special methods; Heavy residue mounts; Photomicrography with the petrological microscope; Index. BMU

## B. GEMS, SEMIPRECIOUS STONES, JADE, AND MINERALS

259. BALL, SYDNEY H. *A Roman book on precious stones*, including an English modernization of the 37th booke of the *Historie of the world*, by E. Plinius Secundus. Los Angeles, Gemological Institute of America, c1950. 338 pp.

Contents: Preface; Sect. I. *Introductory chapters*: The author, Pliny the Elder; Authorities cited by Pliny; Pliny as a mineralogist and gem

expert; Roman jewelry; Roman jewelers and lapidaries; Geographical sources of gems; Geographical sources of gems (table); Historical summary of the ancient commerce in precious stones; Value and relative rank of precious stones in Pliny's time; Gem mining in Pliny's day; Treated and false stones; Industrial uses of gems; Identification of Pliny's precious stones with those of our day; Table A—Pliny's gems and minerals with their modern equivalent; Table B—Gemstones, minerals, and substances with Pliny's name; Sect. II. *Translation*: Foreword to Section II. 37th Book of the natural history of the world, by Pliny the Elder—a modernized version of Philomen Holland's translation; Appendix: 36th Book of the natural history of the world. Sect. III. *Notes*: Notes, the 37th Book of the natural history of the world; Notes, Appendix to 36th Book of the natural history of the world; Index. BMU

260. DAKE, H. C. Lapidary art as practised in ancient and medieval days. *Mineralog. (Portland, Oreg.)*, 19 (Mar. 1951), pp. 119–123, 130. Reprinted under the title: The art of the lapidary in olden days. *Gemmologist*, 20 (1951) I. Early publishing methods, pp. 98–99; II. Evolution of facet cutting, pp. 122–123; III. Cutting, polishing and engraving, pp. 146–148. MB

261. DRAY, EVE, and MYERS, OLIVER H. Glazed quartz beads of the Romano-Arab period. *J. Egypt. Archaeol.*, 32 (1946), pp. 65–68.

Examples are given of late Egyptian quartz beads coated with colored glass in imitation of semiprecious stones. The conclusions are based on examination with the microscope. An extensive table of data and a plate are included. ERC

262. EVISON, V. I. The white material in Kentish disc brooches (Anglo-Saxon). *Ant. J.*, 31 (1951), pp. 197–200.

Analysis of the material eliminates bone and ivory. Dr. F. A. Banister's examination by X-ray diffraction of the white inlay around the jewels in eight bronze brooches show a variety of materials including cristobalite, magnesite, calcite and others. It appears that the original inert materials were ground down and mixed as a paste. IG

263. GURE, DESMOND. Notes on the identification of jade. *O.A.*, 3 (1950), pp. 115–120, illus.

Hardness estimation with a sharp steel point is not satisfactory for distinguishing nephrite and jadeite from similar looking minerals because of physical alteration and surface decomposition of jade during long burial. X-ray diffraction methods are the most reliable for distinguishing nephrite from jadeite and these in turn from the jadelike minerals. Powder patterns of nephrite, actinolite, jadeite, and serpentine are shown juxtaposed. RJG

264. HANSFORD, S. HOWARD. Catalogue of the exhibition of Chinese jades. *T.O.C.S.*, 23 (1947–48), pp. 46–50.

The introduction gives an account of the tools and methods used in working jade. MB

265. HANSFORD, S. HOWARD. *Chinese jade carving*. London, Lund Humphries & co., ltd., 1950. xi, 145 pp., col. front., 32 numb. pls.

Contents: Preface; Principal Chinese Dynasties; Preliminary; The material; Sources of supply of the jade stone; Methods of jade carving; Progress of the craft in China; Bibliography; Index.

Reviewed in: *O.A.*, 3 (1950), p. 41, by Edgar E. Bluett. *Artibus Asiae*, 13 (1950), pp. 303-305, by Alfred Salmony. BMU

266. HAWKES, CHRISTOPHER F. C. An unpublished Celtic brooch from Danas' Graves, Kilham, Yorks. *Ant. J.*, 26 (1946), pp. 187-191.

Dr. Moss reports on the various inlays on a bronze brooch. In one case "a white stone, of the nature of tufa or travertine," in another "certainly not coral, 'paste,' not tufa but presumably shell, possibly dentalium." IG

267. LEWIS, M. D. The identification of gemstones in antique jewelry. *Connoisseur*, 118 (1946), pp. 93-97, illus.

Identification of gemstones in antique jewelry offers special difficulties because the jewel cannot be removed from the mount. Each of the principal tests used to identify gemstones is described. These range from simple tests on heat conductivity, hardness, fracture, luster, dispersion, double refraction, and inclusions which may be carried out with no greater aid than an ordinary lens. The simpler gemmological instruments are next described. They are: Chelsea filter, dichroscope, spectroscope, refractometer, and microscope. Most inclusive method of differentiating stones is the determination of refractive index by immersion in liquids of varying refractive index. RJG

268. MEIXNER, HEINZ, HAAS, HILDE, and KAHLER, FRIEDRICH. The stones and metal of Hemma's ring and pendant of the Cathedral of Gurk, Carinthia. *Carinthia*, II, 142 (1952), pp. 81-82; *C.A.*, 48 (1954), 1206i.

The ring and pendant, supposedly smoky quartz set in Au, date back to the 11th century. Optical determinations show the stones to be corundum with inclusions of rutile. Spectrographic determinations show the metal to be Ag alloyed with 5-10 percent Cu and covered with Au. Also found were Hg, probably from the gilding process, Sn, Pb, Zn, Pd, and Pt, also Ca, Al, Mg, and Si. Few occurrences of Pd-bearing Au are known; the Caucasus is a possible source.

269. ROGERS, FRANCES, and BEARD, ALICE. *5000 years of gems and jewellery*. New rev. ed. Philadelphia, New York, J. B. Lippincott company, c1947. 309 pp., illus. plates (part col.).

Contents: Foreword. Part I. A cavalcade of gems and jewellery; The mysterious attraction of gems; The gold-smith-jeweller of Egypt; Jew-



ellers of Phoenicia and Greece; Jewellers of Italy; Early jewellery of the British Isles; Jewellers of the Middle Ages; Jewellers of the Renaissance; Jewellers of the 17th century; European jewellery, 18th and 19th centuries; The New World; Part II. Gem materials: Hard, rare, and of great beauty; Gem crystals and forms of gem cutting; Part III. Gemstones: Precious stones; Semi-precious stones; The quartz gems and various ornamental stones; Marine gems; Appendix I: Summary of gemstones; II. Birthstones; III. Selected bibliography; Glossary; Index.  
BMU

270. RUFF, ELSIE. Jade of the Maori. *J. Gemmol.*, 70 (1944), pp. 379–381, 439–443, 559–561, 619–621; 71 (1945), pp. 22–23, 129–140, 199–200, 248–250, 319–321; *Mineralog. Abstracts*, 9 (1946), p. 196; *C.A.*, 42 (1948), 4500.

Occurrences and properties of New Zealand nephrite are given. New determinations gave  $n$  1.60–1.65,  $sp.$  gr. 2.902–3.024, hardness  $5\frac{1}{2}$ –7.

271. SWETT, J. M. The decomposition of pyrite. *M. J.*, 43 (Apr. 1943), p. 8.

Damp speeds the decomposition of pyrite. Treatment of decomposing pyrite with ammonia gas. IG

272. WADE, FRANK B., GEISLER, WALTER C., and CALVERT, CECIL. Composition and color of some American turquoise. *Gemmologist*, 18 (1949), no. 210; *C.A.*, 43 (1949), 5705.

The small Cu content is considered insufficient to account for the blue color of turquoise. Analyses of impure turquoise matrix show presence of C and N (detd. by Kjeldahl method with Hg catalyst) which are attributed to some complex  $Cu\ NH_4$  ion or amino Cu ion.

273. WEBSTER, ROBERT F. G. A. The identification of gemstones by colour. A series of non-technical articles on the identification of gemstones. *Gemmologist*, [beginning] 16, no. 188 (1947), pp. 77–85 through v. 18, no. 221 (1949). In 32 parts. MB

274. WEBSTER, ROBERT F. G. A. Synthetic gemstones. *Gemmologist*, 21 (1952), pp. 66–70.

The microscopic examination of synthetic gemstones. MB

275. WEINSTEIN, MICHAEL. Scarabs. *Gemmologist*, 20 (1951), pp. 169–172.

A short article on the material from which scarabs have been made. MB

276. WENLEY, ARCHIBALD G. Early Chinese jade. *Sci. Monthly*, 63 (1946), pp. 341–347, illus.

The physical properties of the three minerals which are termed jade are described. Nephrite, most used and prized by the ancient Chinese,



is tough, compact, and fibrous. It has Moh's hardness 6 to 6.5 and sp. gr. 2.96 to 3.1. Jadeite has vitreous lustre, is crystalline rather than fibrous, has hardness 6 to 7 and sp. gr. 3.3 to 3.5. Chloromelonite, a dark green to almost black variety of jadeite, contains iron up to 10 percent. Although specific gravity measurements can distinguish jadeite from nephrite, the method has limitations in respect to archaic specimens, because jade deteriorates on long burial usually with a lowering of specific gravity value.

The principal forms of archaic jade are described; a brief description of the modern working of jade is given. RJG

277. WHITLOCK, HERBERT P., and EHLMANN, MARTIN L. *The story of jade*. New York, Sheridan house, c1949. 222 pp., pls.

Contents: Jade, the many colored jewel of heaven; The jade of ancient China; Dragons, phoenixes, and other creatures; Taoist symbols; Gods and immortals; How Buddhism influenced Chinese carved jade; Salutations and inscriptions; Bowls, cups and other containers; Beads, buckles and other articles of adornment; Various objects carved from jade.

The first chapter of this work discusses jade as a mineral, mentions the places where it is found, the colors in which it occurs, the minerals that resemble jade, their colors and specific gravities. It ends with brief remarks on jade carving in China. JAP

### C. CERAMICS AND CERAMIC GLAZES

278. ALBRIGHT, W. F., KELSO, JAMES, and THORLEY, J. PALIN. Early bronze pottery from Bâb Ed-drâ in Moab. *B.A.S.O.R.*, no. 95 (1944), pp. 3-13.

The first part of this paper, written by the first author listed, deals with the description and chronology of the pottery as derived from the examination of sherds and larger fragments, and the second part, by the other two authors, deals with the ceramic techniques.

All the ware belongs to the class of heavy-duty red clay pottery, for light pieces are rare, and no thin ware is represented. Most of the ware was tempered with small fragments of limestone about the size of fine to coarse sand, but sometimes the tempering material was quartz sand. Kiln tests showed that the proportion of limestone was less than that in the pottery from Tell Beit Mirsim and that most of the ware had been fired below 900° C. All ware was shaped by hand, there being no evidence of the use of the wheel. When slip was used, it was well made and sometimes burnished. No indication of painting was observed. ERC

279. BEAZELEY, JOHN DAVIDSON. *Potter and painter in ancient Athens*. London, Geoffrey Cumberlege Amen house, 1946. 43 pp. 6 pls. Reprinted from: *Proceedings of British academy*, v. 30 (1946).

A revised and expanded copy of a lecture delivered to the Joint Meeting of Classical Societies at Oxford in September 1942. BMU

280. BLUETT, EDGAR E. The dating of early Ming blue-and-white. *O.A.*, 1 (1948), pp. 56-60, illus.

The types of blue used in the manufacture and the periods in which they were in use. RMM

281. BOUSQUET, J., and DEVAMBEZ, P. New method in restoring ancient vases in the Louvre. *Museum (Paris)*, 3 (1950), pp. 177-179, fig.

After describing the condition of certain vases in the Louvre resulting from nineteenth-century restoration technique (miscellaneous assembly of fragments, extrusive overpainting, etc.) the authors give an account, illustrated with examples of their technique for cleaning and correct reassembly. The adhesive is "cellulose gum"; filling is done with tinted plaster, and copper reinforcement where necessary. Inpainting is done in oil and wax polish is applied. SRJ

282. BRAILSFORD, JOHN. Excavations at Little Woodbury. *P.P.S.*, 15 (1949), pp. 156-168.

Appendix A, p. 165: Comparative analyses of pottery; Appendix B, p. 166: Report on the petrology of Quern fragments. IG

283. BROWNELL, W. E. Fundamental factors influencing efflorescence of clay products. *J. Amer. Ceram. Soc.*, 32 (1949), pp. 375-389, illus.

The clay materials studied were shales from western New York State. Test procedures are described. The sulfates of Mg, Ca, Na, K, and Al were the most common efflorescing salts. Chlorides seem to play little part in efflorescence. Insoluble sulfides in clays are common sources of S from which sulfates are formed. Barium compounds do not prevent the formation of alkali sulfates during firing but can prevent formation of the alkaline earth sulfates. "The migration of a salt solution through a ceramic body is the direct cause of efflorescence. The salts accumulate on an exposed surface where relatively rapid evaporation takes place. At the points of greater evaporation these salts are precipitated from solution when the saturation point is reached. This migration of a solution through a ceramic body is a function of the absorption of the body." A ceramic body with zero absorption does not effloresce. Slightly soluble, as well as extremely soluble salts, will cause efflorescence. Twenty-two photomicrographs of soluble salts grown from solutions are shown, 107 references. RJG

284. CAGIANO DE AZEVEDO, MICHELANGELO. Sulla autenticità di alcune terracotte del Metropolitan Museum. *Boll. ist. centrale restauro*, 1 (1950), p. 44.

De nombreuses craquelures dues à l'âge devraient enlever tous les doutes concernant l'authenticité. FD

285. CALEY, EARLE R. Results of a chemical examination of some specimens of Roman glaze from Tarsus. *Amer. J. Archaeol.*, 51 (1947), pp. 389-393; *C.A.*, 42 (1948), 9105.

Each of eight sherds examined was coated smoothly with a clear, glossy, brownish-yellow glaze inside and with a less transparent, glossy, dark-green glaze on the exterior. The exterior glaze of a ninth sherd showed extensive decomposition by chemical action during burial. Scratching with a W carbide pencil was used in sampling. Analyses given suggest that the green glaze is a Pb silicate glass containing both Cu and Fe silicates to explain the green color. The yellow glaze is essentially a Pb silicate glass colored by a higher proportion of Fe silicate. A hypothetical ancient working formula for making green glaze is presented. The high proportion of Pb present might serve in distinguishing between genuine ancient Pb-glazed ware and modern imitations thereof. The use of Pb glazes in Asia Minor in Roman times appears to be established.

286. CHOW FONG. Celadon and *chün* type glazes. *F.E.C.B.*, no. 10 (June 1950), pp. 90-93, illus.

The author describes briefly how he produces celadon effects on modern pottery. Certain celadon type glazes were produced by iron oxide alone or with ferruginous clays. Other celadon effects were gained in experiments with copper oxides in glazes fired in an oxidation kiln making use of iron and cobalt to modify the green color. *Chün* type glaze effects were obtained by (1) applying a glaze containing copper over an iron glaze and then firing in a reducing atmosphere which causes blue or green to be produced with red and purple markings; also (2) by using more copper than iron despite the fact that some Sung glazes show, from spectrographic analysis, more iron than copper; rigid control must be exercised in firing. Comments are made on the production of crackle effects. RJG

287. DELOUGAZ, PINHAS. *The pottery from the Diyala region*. Chicago, Univ. of Chicago press, c1952. 182 pp., plates (part col.), facsimiles, tables, maps (part fold.). (Oriental institute publications, v. 63.)

Contents: Includes these chapters—System of pottery classification; Description of the pottery . . . Pottery forms by periods and phases . . . Index. BMU

288. FELTS, WAYNE M. A petrographic examination of potsherds from ancient Troy. *Amer. J. Archaeol.*, 2s. 42 (1946), pp. 237-244, pls. XIII-XIV.

Twelve photomicrographs of sherds are given with accompanying diagrams to describe the important features. Pottery of local manu-

facture contains certain rock and mineral types native to the region drained by the Menderes River. Certain of the different horizons at Troy have unique rock and mineral types as the coarser elements of the materials used in their pottery. There is a definite progression in the internal texture of the sherd from a coarse porous aggregate of clay and "tempering" material having no preferred orientation of fragments within the paste in the earlier horizons to a fine-grained, dense, thin-walled sherd in the later horizons. "Foreign" sherds can be distinguished from those of local make. The degree to which the different sherds were fired can be estimated. RJG

289. FERNALD, HELEN E. Discovery of iron armatures and supports in Chinese grave figurines of the 6th and early 7th centuries. *F.E.C.B.*, no. 11 (Sept. 1950), pp. 105-108, illus.

The cracking of several figurines in the Royal Ontario Museum of Archaeology in Toronto is caused by the rusting and expansion of iron armatures. Practical potters regard use of such armatures impossible because of expansion of the iron during firing. Space for expansion might have been provided by wrapping the iron rods with strips of thin paper or other material which could be absorbed during firing. Many questions remain unanswered. RJG

290. FEWES, VLADIMIR J. Catawba pottery-making, with notes on Pamunkey pottery-making, Cherokee pottery-making, and coiling. *Proc. Amer. Phil. Soc.*, 88 (1944), pp. 69-124.

A detailed and profusely illustrated account is given of all the techniques employed in the manufacture of pottery by contemporary descendants of certain Indian tribes. ERC

291. HETHERINGTON, ARTHUR LONSDALE. *Chinese ceramic glazes*. 2d rev. ed. South Pasadena, Calif., P. D. and Ione Perkins, 1948. 114 pp., plates (part col.).

Contents: Preface; General considerations; The iron story; The copper story; Other glaze effects; Glossary; Selected bibliography; Index. Reviewed in: *O.A.*, 2 (1949-50), pp. 126-128, by William Willetts. BMU

292. HETHERINGTON, ARTHUR LONSDALE. Chinese ceramic glazes with special reference to those derived from copper. *Nature (London)*, 163 (1949), p. 900.

A summary of a Wednesday evening discourse at the Royal Institution mentioning the blue to green coloration obtained by the solution of cupric oxide in more or less basic glazes and the *sang-de-boeuf* and peachbloom glazes due to reduction of cupric oxide to more or less finely divided metallic copper. RMO

293. HETHERINGTON, ARTHUR LONSDALE. An interesting and accidental reduced copper-on-glaze effect. *Trans. Brit. Ceram. Soc.*, 42 (1943), pp. 182-183. MB



294. HETHERINGTON, ARTHUR LONSDALE. Pre-Ming wares of China. *Trans. Brit. Ceram. Soc.*, 41 (1942), pp. 257-264; *Chem. Zentr.* Pt. 1 (1942), p. 403; *C.A.*, 37 (1943), 2899.

Types of ware produced in China during the 1,500 years preceding the Ming dynasty, established in 1368, are discussed and illustrated.

295. HETHERINGTON, ARTHUR LONSDALE. Three notes. *T.O.C.S.*, 19 (1942/43), pp. 48-51, pls.

(a) On-glaze copper. An interesting and accidentally reduced copper-on-glaze effect . . . (c) Note on a *sang-de-boenf* brush pot. The restoration of a badly scratched glaze by polishing. MB

296. HOGG, ROBERT. The restoration of pottery. *M. J.*, 47 (Jan. 1948), pp. 188-193.

Use of inner and outer templates and clay core. IG

297. HOLLEYMAN, G. A. Three Craggans. *Antiquity*, 21 (1947), pp. 205-211.

Description of shape and methods of making Hebridean Craggan pots. IG

298. HONEY, WILLIAM BOWYER. *The ceramic art of China and other countries of the Far East*. London, Faber and Faber limited, and the Hyperion press limited, 1945. 238 pp., illus. (incl. map), 195 pls. (part col.).

Contents: Introduction: Historical outline and technique; China; Indo-China; Corea; Japan; Appendices: A. Note on the spelling and pronunciation of Chinese names. B. Marks. C. Glossary of Chinese names for shapes, colors, etc. D. Patterns and subjects used in the decoration of Chinese porcelain. E. Forgeries and copies; Bibliography; Tables of Chinese dynasties; Index.

Reviewed in: *Apollo* (London), 42 (1945), pp. 266-271, by Victor Rienaeker; *Connoisseur*, 116 (1945), p. 128, by H. G. F. RMM

299. JAKLITSCH, J. J., JR. Assyriology—"Briefing the Record." *Mech. Eng.*, 70 (1948), pp. 446.

A description of the use of an electric furnace in the restoration of imperfect Babylonian clay tablets is given as part of this news section. SR

300. JONES, FRANCES FOLLIN. Rhosica vasa. *Amer. J. Archaeol.*, 49 (1945), pp. 45-51.

The pottery from Rhosus mentioned by Cicero is identified with a distinctive and colorful lead glazed ware of east Mediterranean origin that probably dates from the first century B.C. A list of find spots is given. The presence of lead in a sample of glaze from Tarsus was indicated by index of refraction. (Cf. Caley, *Amer. J. Archaeology*, 51 (1947), pp. 389-393, for quantitative analyses of two samples of such glaze from Tarsus.) ERC



301. JOPE, E. M. The action of fire on Samian. (App. IV in "Two fires of Roman London," by G. C. Dunning.) *Ant. J.*, 25 (1945), pp. 76-77.

Tests to determine the temperature at which Samian was fired, the composition of the "glaze" and the effect of higher temperatures on the "glaze." IG

302. KAPLAN, SIDNEY. Early pottery from the Liang Chu site, Chekiang Province. *A.C.A.S.*, 3 (1948-49), pp. 13-42, illus., facsimis.

The third part of this archaeological report is concerned with the technique and materials of the prehistoric pottery shapes described in the previous parts. Blackening was caused by smoking, painting, "black slip process," and by burnishing and blackening. Construction is variable. Types produced are: (1) laminated ware, (2) thin ware with black core, (3) nonlaminated, (4) slipped wares, (5) homogeneous bodies, (6) coarse reddish wares, (7) coarse gray ware, (8) *Yin-yao* made by the imbibing process. Qualitative spectrographic analysis reveals that the clay used in all parts of such bodies is approximately the same. Quantitative analysis of a typical sherd shows that the dark core and intermediate gray slip both contain about 4 percent of iron; hence the iron does not enter into the problem of coloration. On the same sherd carbon content of the black slip is 3.2 percent while the gray intermediate slip contains 0.9 percent. The black core contains 1.1 percent carbon and 1 to 1.5 percent phosphorus. The latter indicates use of bone charcoal or burned bone in the clay. Soda ash and potash were absent. Some experimental firings are described in connection with study of the laminated bodies. RJG

303. KELSO, JAMES LEON, and THORLEY, J. PALIN. The potter's technique at Tell Beit Mirsim particularly in Stratum A. *A.A.S.O.R.*, 21-22 (1943), pp. 86-142.

Section I of this extensive article deals with the general techniques used in manufacturing ancient Palestinian pottery as illustrated by the ware and sherds found at this site, and Section II gives the results of a detailed technical study of the various types of pottery.

Laboratory kiln tests showed that most of the pottery was made from a red clay, though the pottery itself has a wide range of color. The reasons for this wide range include differences in the original chemical composition of the clay, differences in temperature of firing, the presence of an oxidizing or reducing atmosphere in the kiln, and the application of carbonaceous material which either reduced the iron when the ware was fired at a high temperature or left a deposit of carbon when it was fired at a low temperature. The great majority of the pottery was made from a clay tempered with crushed limestone, apparently because suitable silica sand or flint was not available. Deductions are made as to the probable entire procedure followed in preparing the clay.

The earliest pottery was shaped by hand, but the wheel came into use about the nineteenth century B.C. Slightly later, ware was also

turned, and press-molding was used for certain kinds of objects, such as figurines. Casting was apparently little employed, as only two objects apparently produced in this way have been found.

Glazes were never used at Tell Beit Mirsim. The most common type of decoration was a red slip. Such a slip was ordinarily prepared from a finer portion of the same clay that was used in fashioning an object. However, the best slip was made from a very fine levigated clay of high iron content, and red ochre was apparently sometimes added. No white clay slip was observed on any native ware. The pottery was also frequently burnished by various techniques. Less commonly, ware was decorated with incised lines in various combinations, and painting was also practiced.

Porosity tests on representative sherds show that the porosity of the ware is in general rather high. The lowest apparent porosity was 11.03 percent, the highest 15.75 percent, and the average 12.88 percent. Kiln tests on sets of sherds showed that none of the ware was fired as high as 1030° C., that only a small proportion was fired as high as 970° C., and that most of it was fired below 890° C. In general, foreign ware was fired at higher temperatures than the native ware.

Measurements of the capacities of juglets showed a tendency to produce these in standard sizes. Measurements of the capacities of cups and pitchers showed a fair correspondence to the units of ancient Hebrew liquid measure. Detailed accounts, based on the examination of representative specimens, are given of the techniques probably employed in the production of all the different types of pottery objects.

ERC

304. KIDDER, ALFRED V., and SHEPARD, ANNA O. *Stucco decoration of early Guatemala pottery*. Cambridge, Mass., 1944. (Carnegie Institution of Washington. Div. of historical research. Notes on Middle American archaeology and ethnology, no. 35, pp. 23-33, pl.)

"Stucco was used for the embellishment of prehistoric Mexican and Central American pottery in various ways: as a coating, tinted in plain colors, for whole vessels or parts of vessels; as a surface upon which more or less elaborate designs were painted; and as a background of which parts were cut away and filled with colored substances—paint cloisonné."

Some pieces of stuccoed pottery from the lower measures of thick stratum of rubbish on Finca Miraflores in the southwestern part of Kaminaljuyu exhibit a fourth process. A thin red wash was first applied to the pottery and over this a background coat of grayish-white clay. Over the continuous background the design was applied in three operations: first a thick and relatively coarse base-layer was applied; this was then covered with pigment; and finally the edges of the base-layer and of its thin surface layer of pigment were straightened and trued up with a blunt pointed implement. A diagram of the layered structure is shown.

RJG

305. KRING, WALTER D. An analysis of three *Chün*-type shards. *F.E.C.B.*, 1 (Jan. 1949), pp. 30-33; *C.A.*, 44 (1950), 5069*i*.

Two blue (I, II) and one purple-red (III) *Chün*-type shards were analyzed spectrographically and gravimetrically with the hope that the glazes might be duplicated with modern formulas. The compositions were: I,  $\text{SiO}_2$  69.84,  $\text{Al}_2\text{O}_3$  16.76,  $\text{Fe}_2\text{O}_3$  1.88,  $\text{CaO}$  7.03,  $\text{MgO}$  1.28,  $\text{K}_2\text{O}$  2.31,  $\text{Na}_2\text{O}$  1.02,  $\text{MnO}$  0.01,  $\text{TiO}_2$  0.50%,  $\text{PbO}$ —, and  $\text{CoO}$ —; II,  $\text{SiO}_2$  66.05,  $\text{Al}_2\text{O}_3$  8.53,  $\text{Fe}_2\text{O}_3$  1.68,  $\text{CaO}$  7.23,  $\text{MgO}$  1.08,  $\text{K}_2\text{O}$  4.14,  $\text{Na}_2\text{O}$  1.30,  $\text{MnO}$  0.01,  $\text{TiO}_2$  0.02,  $\text{PbO}$  9.09, and  $\text{CoO}$  0.06 percent; III,  $\text{SiO}_2$  70.05,  $\text{Al}_2\text{O}_3$  8.21,  $\text{Fe}_2\text{O}_3$  1.78,  $\text{CaO}$  8.14,  $\text{MgO}$  1.43,  $\text{K}_2\text{O}$  5.21,  $\text{Na}_2\text{O}$  1.86,  $\text{MnO}$  —,  $\text{TiO}_2$  0.60,  $\text{PbO}$  2.73, and  $\text{CoO}$  0.10 percent. Efforts to duplicate I and III were unsuccessful. Under reducing conditions at cone 10 the following formula produced a glaze much like II: Albany slip clay 23; Keene feldspar 29.5; window glass 4; whiting 10; magnesia 0.3; flint 30.5; white lead 16; and  $\text{CoO}$  0.06 percent.

306. LEACH, BERNARD. Pottery and the artist craftsman. *T.O.C.S.*, 20 (1944/45), pp. 43–48.

Notes on glazes relative to Chinese and Japanese underglaze blue and its cobalt content, and on experiments with wood ashes in connection with *Yüan* and *Chün* glazes. RMM

307. LEE, GEORGE J. Numbered *Chün* ware. *T.O.C.S.*, 21 (1945/46), pp. 53–63, 2 pls., figs.

Material and technique of manufacture of *Chün yao* and the use of copper in the glazing effects. RMM

308. MATSON, FREDERICK R. Technological development of pottery in northern Syria during the Chalcolithic age. *J. Amer. Ceram. Soc.*, 28 (1945), pp. 20–25, illus.

The techniques of manufacture and decoration employed by the potters living on the Plain of Antioch from about 4500–2000 B.C. are summarized on the basis of evidence obtained from laboratory study of pottery remains and the local clays. RJG

309. MODDERMAN, P. J. R. Something about the technics of prehistoric and mediaeval earthenware. *Boor en Spade*, 3 (1949), 17 pp.

Introduction; préparation de l'argile pour la poterie, ses propriétés physiques et sa composition chimique; la forme, travail de la pâte, décoration et glaçure; le séchage; la cuisson; conclusion; résumé. FD

310. NAITÔ TADASI. 内藤匡. *Kotôji no Kagaku* 古陶磁ノ科學. Science of ancient ceramics. Tokyo, Hōuncha Co., 1944. 253 pp. Illus.

Contents: Nature of glazes; Composition of glazes, engobe, ferrous oxide, opalescence, ferric oxide, *Temmoku* glaze, green glaze, colloidal copper, cobalt. . . . KY

311. NAITÔ TADASI. Scientific research of old ceramics. *Japn. Ind. Art*, nos. 140–141 (June–July 1950), figs.

This article written in Japanese describes the application of gold in the period Chia-Ching, the glaze of *Chün* ware, and Japanese *Seto*. RJG

312. NAITŌ TADASI. Some notes on *Chün* ware of the Sung dynasty. *F.E.C.B.*, no. 11 (Sept. 1950), pp. 111-112, table.

Five analyses of lavender blue *Chün* glaze and celadon glaze show that the ware does not owe its coloring to copper. The bluish color is the result of opalescence, and it was fired in a reducing atmosphere.

RJG

313. NEWTON, ISAAC. Some ceramic wares reportedly excavated near Changsha. *F.E.C.B.*, no. 21 (Mar. 1953), pp. 4-11, 4 pls., tables.

Description of the many types of ceramic wares of different periods presumed to have come from Changsha. Chemical analyses (by Richard Terry) are given for the potassic salt glaze on a Han green-glazed ware and of the glaze and body of a T'ang piece.

RJG

314. NEWTON, ISAAC. A thousand years of potting in the Hunan Province. *T.O.C.S.*, 26 (1950/51), pp. 27-36, pls., tables.

Three chemical quantitative analyses are given of brownish green glazes on so-called *Yo-chou* ware, which was made in the T'ang-Sung period. One is an alkaline potassic glaze much like a salt glaze; the other two are calcium and aluminum silicate glazes.

RJG

315. NEWTON, ISAAC. Tinfoil as a decoration on Chou pottery. *T.O.C.S.*, 25 (1949/50), 1952, pp. 65-69.

Two recently excavated Chou dynasty [1122-249 B.C.] ceramic jars from Changsha were observed to have a peculiar dark greenish brown "glaze" which showed a wrinkled and a creased appearance and in places straight edges. It appears that the jars were covered originally with a layer of thin (c.0.05 mm.) tinfoil stuck on with a kind of varnish or resinous adhesive and lightly burnished. The surface then may have been treated with a sulfide solution to give it the color of bronze. During long burial the tin was converted to hydrous tin oxide. This discovery indicates an early knowledge of elemental tin in China.

RJG

316. ŌGA ICHIRŌ 大賀一郎, and ŌGA YOSHIKO 大賀嘉子. Cloth impressions on the surface of roof tiles of Ebara group excavated from the ruin of Musashi-Kokubunji temple near Tokyo. *Sci. Pap. Japn. Antiques*, no. 4 (Nov. 1952), pp. 8-19.

Hemp cloth impressions on the ancient tiles were reproduced on the paper by pressing and inking and the reproduced figures were photographed. By this method the number of threads of the cloth was determined. Number of threads which run lengthwise and crosswise was found to be mainly 6 and 6 per cm.

KY

317. ŌGA ICHIRŌ and ŌGA YOSHIKO. On the cloth impression on the surface of ancient tiles of Musahi-Kokubunji temple near Tokyo. *Sci. Pap. Japn. Antiques*, no. 3 (Jan. 1952), pp. 15-20.



Hemp cloth impressions on the surface of ancient tiles of eighth century were reproduced on the papers by pressing and inking and the papers were photographed. From these photographs the thread count of the cloth was easily studied. KY

318. PARKINSON, A. ERIC. The preservation of cuneiform tablets by heating to a high temperature. *Museum News*, 27 (Mar. 1, 1950), pp. 6-8.

Reviews general practices. Gives details of procedure used at the University Museum, Philadelphia, for preheating, firing, washing, and coating clay tablets. RJG

319. POPE, JOHN ALEXANDER. An analysis of Shang white pottery. *F.E.C.B.*, no. 6 (June 1949), pp. 49-54; *C.A.*, 44 (1950), 5070.

Firing tests showed that the probable firing temperature was 1050-1150° C.; spectrum analysis resembled closely that of ball and fire clays. The ware is best described as a fairly light stoneware.

320. Pottery reconstruction. *M. J.*, 45 (May 1945), p. 22.

Use of plaster of Paris mixed with iron cement, sand, and/or calcined flints to restore missing portions of pottery. IG

321. PRENTICE, JOAN. Capodimonte and Buen Retiro porcelain. *Antiques*, 49 (1946), pp. 300-303.

A brief history of the two factories is given. Little reliance can be placed upon marks in separating the production of the two factories, one near Naples and one in Madrid, from each other and from similar contemporary pieces or modern pieces made from the old molds. Attributions must be made on characteristics of size, shape, style, the composition of the paste and the painting. Various characteristics of the original and the later pieces are listed. The author warns of the pitfalls, especially in the larger, more showy pieces. EHI

322. RICHTER, GISELA M. A. Accidental and intentional red glaze on Athenian vases. *A.B.S.A.*, 46 (1951), pp. 143-150.

Accidental red glaze was usually produced when the glaze was protected in some way from contact with the reducing gases of the kiln, such as by the method of stacking, though sometimes it was produced in other ways. Intentional red glaze was probably produced, according to a theory suggested to the author by Theodor Schumann, by a double glazing and firing process. In the first step only those areas of the vases intended to be black were painted and fired, first in an oxidizing and then in a reducing atmosphere. Then the vases were allowed to cool, taken out of the kiln, and the areas intended to be red were painted. Finally, the vases were fired in an oxidizing atmosphere. The newly painted areas came out red, but the previously painted and reduced areas remained black when the glaze was sufficiently thick. Examination of a number of Athenian vases by the author and her colleagues confirmed this theory, for black glaze never overlapped the red, though sometimes red glaze overlapped the black. ERC



323. ROSENTHAL, ERNST. *Pottery and ceramics from common brick to fine china*. Harmondsworth, Middlesex, Penguin books, 1949. 304 pp., illus.

Contents: Brief history of pottery; What are ceramics?; Clay; Composition of bodies; Shaping processes; Drying and dryers; Firing; Temperature recording; Setting or placing the ware in kilns; Ceramic colours; Bricks and tiles; Refractories; Stoneware; Earthenware and faience; Porcelain and china; Sanitary ware; Insulator porcelain; Low loss ceramics; Exports of the British pottery industry; Glossary; Index.

BMU

324. SAYER, GEOFFREY R., TR. *Ching-tê-chên t'ao-lu*, or the Potteries of China, being a translation with notes. London, Routledge and Kegan Paul, 1951. 139 pp.

Contents: Introduction; Preface; Book I. Illustrated talks (Topography, history, lay-out, staffing and practice at Ching-tê-chên); Book II. The Imperial porcelain factory of the Ch'ing dynasty; Book III. Particulars of the pottery business (manning, decoration and glazes); Book IV. Pottery procedure (terminology, varieties of materials, kiln control); Book V. Kiln wares of Ching-tê-chên during various dynasties; Book VI. Antique wares produced in the town; Book VII. Ancient kilns; Book VIII. Literary extracts (Notes of special subjects); Book IX. Literary extracts (Notes of pieces of pottery); Book X. Additional remarks; Postscript; Appendices; Index.

Reviewed in. *Artibus Asiae*, 15 (1952), pp. 281-282, by Robert Sonin.

RMM

325. SEARLE, A. B. Slipped wares. (Appendix to a report on "An Iron Age A site on the Chilterns," by K. M. Richardson & Alison Young.) *Ant. J.*, 31 (1951), pp. 147-148.

Short note on microscopic examination of four sherds with ferruginous polished slip.

IG

326. SHEPARD, ANNA O. *Plumbate; a Mesoamerican trade ware*. Washington, D. C., 1948. 176 pp. (Carnegie Institution of Washington. Pub. 573.)

Contents: Prefatory note; Introduction; I. Style of plumbate ware; II. Significance of plumbate anthropomorphic effigies; III. Technology of plumbate ware; IV. Criteria for identification; V. Geographic distribution; VI. Excavated plumbate; VII. Wares associated with plumbate; VIII. Plumbate problems, a recapitulation; Appendices; References.

BMU

327. SHEPARD, ANNA O. Rio Grande glaze paint ware; a study illustrating the place of ceramic technological analysis in archaeological research. In *Contributions to American anthropology and history*, no. 39 (1942), pp. 129-262, 27 figs. (Half-title: Carnegie Institution of Washington. Publ. 528.)

This monograph illustrates the important relationship between knowledge of ceramic technology and archaeological research. By means of petrographic analysis, microchemical and spectrographic analysis applied to potsherds, Miss Shepard has been able to determine the geographic origin of many of the varied types of prehistoric pottery originating in the Rio Grande Valley in New Mexico. RJG

328. SHEPARD, ANNA O. Technical notes. In *Technological notes on the pottery, pigments, and stuccoes from the excavations at Kaminaljuyu, Guatemala*, by A. V. Kidder, J. D. Jennings, and E. M. Shook. Washington, D. C., 1946, pp. 261-277. (Carnegie Institution of Washington. Publ. 561.)

Fragments of sixty pottery vessels were sectioned; forty-two contained either volcanic ash or volcanic sand as temper. (Mineral components are described in detail.) Basalt and sand and schist temper were observed in occasional pieces. The paste of several fragments has the texture of untempered clay. Although the recognized trade ware of the Kaminaljuyu tombs includes a number of distinctive pastes as observed petrographically, not enough is yet known about geographic occurrence of the various tempers noted to trace geographic origin of the pottery. The data collected raise many questions still to be answered by further archaeological and scientific research.

Pigments identified include samples from stuccoes, pottery, miscellaneous artifacts, paintpots. They were: Reds; oxide containing crystals of specular hematite, red ferric oxide, ferruginous clay, cinnabar, pinks, cinnabar and calcite, cinnabar and diatomaceous earth, ferruginous clay or ferric oxide and calcite. Green: malachite, unidentified copper mineral, malachite mixed with unidentified copper mineral and impure azurite. Yellows: ochre with cryptocrystalline calcite. Black: charcoal and white clay, carbon and calcite.

Stuccoes were of two kinds—argillaceous and calcareous. Examples of the use of clay in place of lime have been found in widely distant regions. The soft opaque calcareous stuccoes are composed of cryptocrystalline calcite and are in all probability made from slaked lime. The hard translucent lime stuccoes seem to have been cemented by calcareous solutions after burial. All painted stucco appears to have been done in secco technique. RJG

329. SHEPARD, ANNA O. Technological note on the pottery from Hells Midden, Dinosaur National Monument. In Lister, Robert H. *Excavations at Hells Midden Dinosaur National Monument*. Boulder, Colo., University of Colorado, 1951, pp. 32-34, fig. (Colorado studies. Series in anthropology, no. 3.) RJG

330. SHEPARD, ANNA O. Technological observations on Mesa Verde pottery. In O'Bryan, Deric. *Excavations in Mesa Verde National Park, 1947-1948*. Globe, Ariz., Priv. print., 1950, pp. 89-91, 93-98, pls.

331. STEGER, W. and SUNDIUS, NILS. Constitution of the Sung ceramic ware. *Porslin*, No. 1/2 (1951), pp. 72-94; *J. Amer. Ceram. Soc.*, 35, no. 11 (1952), p. 195; *C.A.*, 47 (1953), 6624b.

Microscopic, X-ray, and chemical investigations were made of seven types of sherds: northern celadon, olive green; *Temmoku*, black or brown; northern yellow Sung; white Sung or Ting type; *Chün*, pale green to blue green; *T'zu Chou* with white decorated upper side and dark green below; and blue-white *Ying Ch'ing*. The results of the chemical analysis and spectrographic determinations are given.

332. TANABE GIICHI 田邊義一. Some clay figures with asphalt adhered to their broken ends. *J. Anth. Soc. Japn.*, 61 (1949/50), pp. 15-16.

Black substances adhered to some prehistoric clay figures found in Tohoku district were found to be asphalt. The origin of this asphalt may be traced to the petroleum field in Akita prefecture, Tohoku district. KT

333. TODD, WILLIAM. Iron armatures and supports in Chinese grave figurines. *Bull. Roy. Ont. M.A.*, no. 18 (Mar. 1952), pp. 17-18. Cf. Fernald, Helen E. Discovery of iron armatures and supports in Chinese grave figurines of sixth and early seventh centuries. *F.E.C.B.*, no. 11 (Sept. 1950); pp. 105-108, pls.

Evidence is produced that the iron armatures found in sixth to seventh centuries Chinese grave figurines (*Ming ch'i*) were first wrapped in some kind of fibrous vegetable material before the clay was applied; on firing and carbonization of the organic material the necessary room for the expansion of the iron during firing was provided. RJG

334. TODD, WILLIAM. Plastic clay. *Bull. Roy. Ont. M.A.*, no. 17 (1951), pp. 6-7.

A plastic clay or lute useful in restoring pottery and sculpture is made by mixing vinyl acetate (25 percent solution in methylated spirits) and a filler of dry sand, gypsum, whiting, kaolin, or other suitable inert which is ground to at least 200 mesh. The vinyl acetate solution is poured into a ring of the inert on a glass palette and mixing is done with a spatula until the product can be picked up without sticking to the fingers. The putty can be stored in an airtight container with an alcohol-saturated cloth. Before applying, the edges of the surface, to which the putty is to adhere, should be coated with several applications of vinyl acetate. RJG

335. TOLL, NICHOLAS. The excavations at Dura-Europos. Final report IV, Part I, fasc. 1. The green glaze pottery. *Ant. J.*, 25 (1945), pp. 162-163.

J. W. Crowfoot reviews the report citing a description of the materials technique with the technological notes and analyses of the glaze by F. R. Matson. IG

336. WARD, LAURISTON. Suggested outline for description of pottery. *F.E.C.B.*, no. 3 (Nov. 1948), pp. 17-19.

In addition to covering attributes under form and design covers also technical aspects of surface, paste, and methods of construction.

RJG

337. WATKINS, LURA WOODSIDE. *Early New England potters and their wares*. Cambridge, Mass., Harvard university press, 1950. 287 pp., plates.

Contents: Introduction; Technique; Seventeenth-century potters; James Kettle's shard pile; The provincial potters of Charlestown; A potter's daybook; A woman introduces stoneware; Redware potting from Boston to the Cape; Excavations on the Bayley Sites of 1723-1799; The Osborns of Danvers and other Essex county potters; The Quaker potters of Bristol county; Stoneware pottery in Eastern Massachusetts; Some potteries of Central and Western Massachusetts; The Whately and Ashfield group; Pioneer craftsmen of New Hampshire; The Clarks of Lyndeboro and Concord; North of Concord; Redware potters of Vermont; Vermont stoneware potteries; Early Maine potteries; The Maine industry after 1800; Early Connecticut redware and the Goshen group; Potters of New London group; The States family of Greenwich and Stonington; Potters of New London county; Hartford and New Haven potteries; Pots and dishes of Norwalk; Rhode Island; Bennington and kindred developments; The art potteries; Redwood forms; Appendices: 1. Documents relating to the Parkers of Charleston. II. Checklist of New England potters. III. Bibliography; Index.

BMU

338. WILLIAMSON, W. O. Some observations on the behavior of water in ceramic materials. *Trans. Brit. Ceram. Soc.*, 46 (1947), pp. 77-101; *C.A.*, 41 (1947), 6683.

Current opinions on the nature of the clay-water relationship are reviewed. Difficulties in accepting the idea that the adsorbed water has the structure of ordinary ice are outlined. The association between water and nonplastics is discussed; implications in the literature that such materials are not solvated cannot be sustained. If von Buzágh's findings on interparticle forces can be validly extended to plastic clay they suggest that long-range attractive forces exist in this system and accompany a resistance to approach arising from the lyospheres around the particles. For a typical earthenware body in the plastic state a relationship is established between moisture content and dry porosity; this is explicable in terms of a varying degree of particle orientation. Differences in moisture content produced by compression or centrifuging of unconfined specimens are related to Reynolds' dilatancy. This dilatancy is manifested by the nonplastic content of the body, but is not obvious in the ball and china clays. Short-term aging of certain test pieces in saturated air does not yield a more even distribution of water even where aqueous migration occurs. The relationship be-



tween moisture content and dry porosity suggests that a completely homogeneous moisture content may be unobtainable. The backlash phenomenon of Macey is more widely prevalent than is commonly supposed; it is reported in ball clay, china clay, flint, Cornish stone, feldspar, earthenware, bone china, and brick clays. In earthenware, the portion of the testpiece undergoing alternating tension and compression becomes more hydrous from the operation of Reynolds' dilatancy; this increased moisture content does not appear consistently in ball and china clays. The cause of backlash is discussed, and a brief comment is made on the warping and cracking of clayware.

339. YOUNG, WILLIAM J. Discussion of some analyses of Chinese underglaze blue and underglaze red. *F.E.C.B.*, no. 8 (Dec. 1949), pp. 20-26, illus., charts.

Spectrographic estimates are presented (in chart form) for the common elements found in 45 samples of glaze from Chinese pottery mainly of the fourteenth century. RJG

340. YOUNG, WILLIAM J. Some notes on Shōsō-in; T'ang and Ming pottery. *F.E.C.B.*, no. 6 (June 1949), pp. 55-61, illus.

Three fragments of pottery found in the immediate vicinity of Shōsō-in, a T'ang period repository at Nara, Japan, were compared with fragments of T'ang and Ming pottery. Comparison data are presented on specific gravity, glaze hardness, glaze thickness, optical characteristics, color reflectance, and spectrochemical composition. Weight of the evidence indicates that the Shōsō-in pieces originated within the T'ang period. RJG

#### D. GLASS

341. ANGUS-BUTTERWORTH, L. M. The chemistry of glass coloration. *Endeavour*, 6 (1947), pp. 112-118.

Étude des composés chimiques produisant la coloration dans les verres. FD

342. BEZBORODOV, M. A. Russian glass in the twelfth century. *Doklady Akad. nauk, S.S.S.R.*, 74 (1950), pp. 789-790; *C.A.*, 45 (1951), 8729b.

Archaeological finds indicate that glass making in Russia started in the ninth to tenth century. Results of analysis of a glass bracelet relating to the twelfth century are presented.

343. ČTYROKÝ, V. Mosaic glasses. *Sklářské rozhledy*, 19 (1942), pp. 143-152; *C.A.*, 38 (1944), 4107<sup>3</sup>.



The production of mosaic glasses, their chemical compounds (with tables of analysis), and their resistance to atmospheric influences are treated historically. The paper includes photomicrographs of various samples of glass and photographs showing the mounting of mosaic stones and the appearance of defective work. Practical tests showed the alkali content of German glasses to be 12–20 percent, that of Bohemian glasses about 16 percent and that of Italian glasses 20 percent. Leaching and weathering tests on various products indicated the general lines to be followed for the production of resistant melts.

344. DEDECEK, JAROSLAV. Painting and etching techniques for glass. *Sklářské rozhledy*, 18 (1942), pp. 64–68, 155–159; 19 (1942), pp. 32–34; 46–51; *Chem. Zentr.*, Pt. 2 (1942), pp. 1950–1951; *C.A.*, 38 (1944), 3099.

Historical development of glass painting technique, kinds of glass painting, apparatus, preparation and use of glass colors, mechanical directions and practical experience in painting, painting with opaque enamels; recipes and instructions, relief painting, a new type of painting with accurately limited contours with the help of glue; recipes and chemical constitution for enamels in the following colors: bright red, crimson (with Al, Mg or Sn), blood red, chrome green, bright yellow, Naples yellow, green, blue, brown, ocher and black; opaque and mottled enamels; ovens, grinding machines for colors, grinding and mixing of colors; transparent enamels; details on working with fused, water-color type colors; painting with metals and metal compounds (recipes and working directions).

345. DEDECEK, JAROSLAV. Techniques of glass painting and etching. *Sklářské rozhledy*, 19 (1942), pp. 89–92, 133–136, 160–167; *Chem. Zentr.*, Pt. 1 (1943), p. 1809; *C.A.*, 38 (1944), 4107<sup>5</sup>.

Topics discussed include: glazes, yellow glazes, reproduction of Venetian glass, the burning of colors onto the glass, various reproduction techniques for the painting and etching of glass, etching and color printing of plates, transfer designs, silvering and matting of glass objects, polishing, etc. Recipes are given for glazes, for coatings to protect the areas not to be etched, and for silvering and matting baths.

346. HARADA YOSHITO 原田淑人. *Kodai garasu* 古代ガラス. Ancient glass. Tokyo, Koyama Co., 1949. 32 pp., illus.

Contents: Preface; Origin and development of glass; Ancient Chinese glass; Ancient Korean glass; Ancient Japanese glass. KY

347. HEDVALL, JOHAN ARVID, and JAGITSCH, ROBERT. The destruction of antique glasses. Part I. Equilibriums and reaction velocities in systems glass-gas. *Chalmers Tek. Högsk. Handl.*, 19 (1943), pp. 5–53; *Chem. Zentr.*, Pt. 2 (1943), pp. 6, 556–557; *C.A.*, 38 (1944), 4393.

The destruction of glass in air is due essentially to interaction of glass and gases. The adsorption of gas is preliminary to its solution in

glass and to the final chemical reaction and the destruction of the glass. Lowering of temperature and increase of pressure shift the equilibrium in the direction of formation of decomposition products. The destruction in air starts with water adsorption, which continues as an increased hydration and is succeeded by carbonate formation. The rate of destruction is a function of the alkali content of the glass and is affected by temperature and humidity. The effect of indifferent gases is negligible. Degassing experiments on a piece of antique glass at 20, 150, 280, 400, and 560°, together with experiments on the destruction of glass rich in alkali by water vapor, confirm previous theories of the importance of glass composition and the role of water vapor in its destruction. Glass of any composition constitutes with air a thermodynamically unstable system, which must decompose eventually. A protective layer of transparent resin, as suggested by G. E. Pazaurek ("Kranke Gläser," Reichenberg, 1903), is good only when applied after degassing in vacuo at slightly raised temperatures, and cooling in vacuo.

348. HEDVALL, JOHAN ARVID, JAGITSCH, ROBERT, and OLSON, GILLIS. The problem of restoring antique glass. Part II. Covering the glass surfaces with protective film. *Off. Tech. Serv. Rept.* PB 105977. (1951), 17 pp., photos, diagrs., graph. Text in German; Summary in English. Summarized in: *Chalmers. Tek. Högsk. Handl.*, no. 118 (1951), pp. 3-15; *Abstract Review*, no. 181 (1952), p. 140.

The decay of ancient glass can be considered as a problem of the action of the gases present in the atmosphere on the glass. It is a question of both chemically active and chemically inert gases, especially carbon dioxide and water vapor. Through absorption these gases form monomolecular films on the glass. As ancient glass is generally rich in alkali a leaching process takes place, and finally only a framework of silica is left. The destructive process can be stopped by the following method. The glass object is first treated with carbon tetrachloride in order to remove fatty substances from the surface. The reaction products from the attacks of carbon dioxide and water vapor are then removed by submerging the object in dilute nitric acid (5 pC.). After washing and drying, the object is placed in an evacuating chamber until a vacuum of  $10^{-6}$  mm. mercury is reached. The chamber is then slowly filled with lacquer and equally slowly drained. The glass object will then have acquired a uniform film of lacquer, and is left to dry. The choice of resin as well as of solvent for the lacquer is most important. The lacquer must have a low viscosity even in concentrated solution in order to fill the pores and capillaries in the glass, and it must be color-fast and have a suitable refraction index. After investigating a number of substances it was found that polymethyl methacrylate best fulfilled the conditions.

349. HONEY, WILLIAM BOWYER. . . . *Glass; a handbook for the study of glass vessels of all periods and countries and a guide to the museum*

*collection* [Victoria & Albert]. London, Pub. under authority of the Ministry of education, 1946. 169 pp., pls.

Contents: Introduction; Ancient Egyptian glass; Roman glass; Medieval European and Islamic glass; Venetian glass; German and Bohemian glass; English glass; Netherlandish glass; French glass; Spanish glass; Chinese glass; Scandinavian and American glass; Indexes. BMU

350. HUBBARD, D.; JENKINS, L. B.; and KRUMRINE, E. M. *Amelung* glasses compared with some modern glasses. *Sci. Monthly*, 75 (1952), pp. 327-338.

Excellent technical article by National Bureau of Standards (U.S.A.) scientists concerning the nature of the glass produced by this early American industrial plant. Documented with photographs, analyses; 15 references. RLF

351. MATSON, FREDERICK R. Composition and working properties of ancient glasses. *J. Chem. Educ.*, 28 (1951), 82-87; *C.A.*, 45 (1951), 5377i.

A complete summation of the analytical work on ancient glasses covering the last hundred years. Included is a table giving eight typical analyses of Egyptian, Roman, and Babylonian glass, with comments on each composition. Twenty-seven references.

352. MATSON, FREDERICK R. Glass standards of weight and volume in eighth century Egypt, Part I. *Glass Ind.*, 30 (1949), pp. 487-491, 516-518; Pt. II, *ibid.*, pp. 548-552, 574, illus.

The Arabs had a unique use for glass: they used it in making standards to check the constancy of weight of metal coins. This was done in a sort of Arabic Bureau of Standards in Cairo called the Dar al-Ayar, where all scales and weights were tested. In this rather complete discussion of glass checkweights, much technical information is given on composition, fabrication, and the physical properties of numerous samples of early Arabic glass weights and stamps. Several complete glass analyses are listed. RJG

353. RIEFSTAHL, ELIZABETH. *Glass and glazes from ancient Egypt*. Brooklyn, Institute of Arts and Sciences, The Brooklyn Museum, 1948. 24 pp., illus.

Reviewed in: *Antiquity*, vol. 24 (1950), p. 167, by O. B. Harden. Basic information is set out clearly and effectively in nontechnical language. References: p. 17. BMU

354. SEITZ, FREDERICK. Physics of pigments and glasses; a conference held at the University of Pennsylvania. *J. App. Phys.*, 13 (1942), pp. 595-643, illus.

"Both play a role in the formation of ceramics and enamels; both have interesting mechanical properties that appear when they are

ground or when their mechanical strength is under consideration; problems of opacity and light scattering arise when pigments are used in paints or when glasses are used in opal or ruby form; both may be darkened or decomposed by the action of visible or ultra-violet light."

R. H. Sawyer. The basic principles involved in the preparation of pigments. *Ibid.*, pp. 596-601; *Review*, 16 (1943), p. 99; *C. A.* 37 (1943), 271.

Pigment materials are selected on the basis of light absorption and refractive index properties. Pigments of high hiding power must have high refractive index. While pigments must be transparent as massive materials, whereas colors must have intense and highly selective absorption. Given a suitable base material, the preparation of a pigment from it is a problem in particle size control. Highest hiding power value is obtained by preparation of critical particle size of the order of the wavelength of light.

B. E. Warren. The basic principles involved in the glassy state. *Ibid.*, pp. 602-610.

"To describe a substance as being in the glassy state, it must have taken on its properties of a solid merely by being cooled down from a fused condition, the increased rigidity by cooling must have been secured without recrystallization of the material, the substance should be capable of being carried back and forth from the fused or molten state to the glassy state merely by lowering or raising the temperature without appreciable change in the material when brought back to the same state, and when in the glassy state, should be a brittle, amorphous solid exhibiting conchoidal fracture." The present picture of atomic arrangement in glass has developed from various kinds of information; the laws of crystal chemistry, the X-ray diffraction study of glass, the various measured physical properties of glass, and the kinds of materials and ranges of composition in which glass forming properties exist.

Henry Green. The physics of pigments in dispersed systems. *Ibid.*, pp. 611-622. There are four fundamental types of consistency curves: Newtonian, dilatant, pseudoplastic, and plastic. Newtonian and pseudoplastic suspensions are usually clear liquids and show no structure under the microscope. Dilatant materials are always crowded systems. The pigment will be found in Brownian motion and consequently deflocculated. Plastic suspensions are always found to be flocculated. Photomicrography of examples of each of the suspensions named are shown each with its consistency curve.

F. W. Preston. The mechanical properties of glass. *Ibid.*, pp. 623-634.

The 200-inch mirror of Mount Palomar is made of glass for its mechanical properties alone. "In this case we are concerned with permanence of shape, freedom from 'creep,' freedom from elastic hysteresis, freedom from warping and from thermal distortion." The properties of glass in respect to brittleness, strength, fatigue, variation of strength with temperature, tendency to crack, and effect of moisture are described.



C. Robertson. Glass-pigment systems. *Ibid.*, pp. 635-638. Pigmenting of ordinary glass is infrequent because the pigments do not remain as such during long meltings. Most glass used for coating purposes is pigmented. There is no intrinsic difference from the viewpoint of physical optics between a pigmented glass layer and a pigmented paint vehicle layer. There tends to be some pigment destruction even in glasses used as coatings and to the extent to which this occurs, it greatly complicates any mathematical development. A table is shown of typical compositions of glasses of various types and also one showing typical compositions of pigments for ceramic use.

Frederick Seitz. The darkening of materials by light. *Ibid.*, pp. 639-643. *C. A.*, 37 (1943), 36.

Covers the darkening of inorganic materials like alkali halide crystals, silver bromide, zinc sulfide, and lead chromate. In these certain of the electrons contained in the materials are excited by absorption of radiation. In the excited state, secondary processes occur which allow the electrons to remain in an excited state and absorb wavelengths which differ from those they absorbed originally. The darkening process frequently can be reversed by application of heat since this allows the excited electrons to return to their original state. RJC

355. SOFIANOPOULOS, ATHANASIOS J. Primordial glasses. *J. Chem. Educ.*, 29 (1952), pp. 503-506.

A review of the early knowledge of glass from Classical writings. Contends that the glassmaking formula was not an accidental discovery of Phoenecian seafarers but was developed by the Egyptian potter. After Alexandria, Byzantine Greece became the center of glass manufacture and finally through Venice the art spread westward. In early times the Greek word *hyelos* and the western equivalent *glassa* or *glaesum* did not apply specifically to silicate glasses but were used to designate transparent gums, tree-resin tears, fossil resins, or most any product that hardened from the viscous state. Early writers even considered crystalline stone and rock crystal as glass. Gumglasses, which were used by the Egyptians in embalming and for the protection and decoration of coffins, eventually came to be called *veronikia*, from which we get our modern term "varnish." RJC

356. SUBRAMANIAN, R. Analysis of ancient glass beads. *Current Sci.*, 19 (1950), p. 19.

The dark blue and nearly opaque beads from the site of Arikamedu near Pondicherry and dated first century A. D. analyse:  $\text{SiO}_2$ , 73.6 per cent;  $\text{Al}_2\text{O}_3$ , 1.9;  $\text{FeO}$ , 2.0;  $\text{Fe}_2\text{O}_3$ , 1.1;  $\text{CaO}$ , 3.9;  $\text{MgO}$ , 1.4;  $\text{K}_2\text{O}$ , 13.4;  $\text{Na}_2\text{O}$ , 2.1;  $\text{MnO}$ , 0.4; Total 99.8. The color of the glass is caused by the iron, and the ratio of ferrous to ferric is 1.82. The small amount of Mn may also have contributed to the color. RJC

357. Tests on cup plates. *Antiques*, 48, no. 5 (Nov. 1945), p. 286.

An attempt was made to confirm by scientific analysis the stylistic attributions of 38 American pressed-glass cup plates to sources east or



west of the Allegheny Mountains. The lead content of a given piece of glass has been recognized as a possible means of identifying its provenance. The tests consisted of observations of fluorescence and specific-gravity determinations. It was decided that cup plates having a specific gravity of over 3.100 and a basic bluish reaction under ultraviolet light are of eastern manufacture and that plates having a specific gravity of under 3.090 and producing a yellowish or other than bluish fluorescence are of western make. The stylistic and scientific attributions were in agreement in 81 percent of the plates considered. EHJ

358. UNWIN, MAX. Treatment for the preservation of glass. *M. J.*, 51 (1951), p. 10; *C.A.*, 45 (1951), 4975i.

Decayed Roman glass can be preserved and made more attractive by dipping in a 25 percent solution of polyvinyl acetate in  $C_6H_5CH_3$ .  $n$  of the plastic coating is 1.467 which is sufficiently close to the  $n$  of the glass to make the object nearly transparent.

359. VARSHNEY, Y. P. Glass in ancient India. *Glass Ind.*, 31 (1950), pp. 632-634; *C.A.*, 45 (1951), 2165f.

The discovery, location, probable history, and chemical analyses of various ancient glasses are given.

360. YAMASAKI KAZUO 山崎一雄, MIWA FUSAKO 三輪房子 and ŌHASHI NAOKO 大橋直子. Chemical composition of glass beads found in an ancient tomb in Aichi Prefecture. *Sci. Pap. Japn. Antiques*, no. 3 (1952), pp. 28-30.

Two kinds of glass bead, A and B, found in the Hakusay-yabu tomb near Nagoya city (Aichi Prefecture), were analysed. A is pale green and opaque, while B is blue and transparent. The density  $d_{\frac{25}{4}}$ , refractive index  $n$  and chemical composition of both beads were given in Table 1. They are composed of soda-lime glass colored mainly with

	A	B
$d_{\frac{25}{4}}$	2.40	2.49
$n$	1.502	1.505
SiO <sub>2</sub>	60.47	65.60
Al <sub>2</sub> O <sub>3</sub>	12.04	4.01
Fe <sub>2</sub> O <sub>3</sub>	0.18	0.24
TiO <sub>2</sub>	0.34	0.09
MnO	0.56	0.004
CaO	6.68	7.18
MgO	0.42	2.43
Na <sub>2</sub> O	14.91	15.63
K <sub>2</sub> O	3.67	3.47
PbO	0.27	0.07
CuO	0.42	0.24
CoO	0.	0.003
SO <sub>3</sub>	0.17	0.44
	100.13%	100.24%

copper. The high content of alumina in A indicates the probable use of clay or feldspar as raw materials. The age of Hakusan-yabu tomb is supposed to be of fourth century. KY

361. ZERFOSS, S., and HESS, R. L. Qualitative spot tests for common constituents of glass. *J. Amer. Ceram. Soc.*, 28 (1945), pp. 16-20; *C.A.*, 39 (1945), 1029.

Procedures are given for spot tests using organic reagents according to the technique of Feigl (*C. A.*, 32, 84). To obtain a sample without destroying or damaging the principal surfaces by an etch, the edge of the specimen is rubbed against a roughened or sanded flat plate of rock crystal or silica glass. One rubbing will yield about 0.1-0.4 mg. of material—the rubbing can be repeated until an adequate sample is obtained. To insure removal of HF before making the spot test the following procedure is used: The finely powdered sample is mixed in a platinum vessel with 10 percent HF solution (containing 10 percent  $\text{H}_2\text{SO}_4$ ) and evaporated to dryness. The solution is repeated several times and finally the residue is taken up in 5N  $\text{H}_2\text{SO}_4$ ). Detailed procedures are given for Ca (with dihydroxytartaric osazone as reagent), for Pb (with carminic acid), for Ba (with Na rhodizonate), for P (with  $(\text{NH}_4)_2\text{MoO}_4$ ), for B (with the flame test), for Ti (with  $\text{H}_2\text{O}_2$ ), for Al (with alizarin), for Zn (with a 2 percent  $\text{H}_2\text{O}$  solution of  $\text{K}_3\text{Fe}(\text{CN})_6$  and a solution of 0.5 gram diethylaniline in 200 cc. of sirupy  $\text{H}_3\text{PO}_4$ ), for Mn (with Titan Yellow), and for K (with  $\text{Na}_3\text{Co}(\text{NO}_2)_6$ ).

#### E. CEMENT, PLASTER, MORTAR, AND BRICK

362. BING, KAI. Efflorescence on masonry. *Chalmers Tek. Högsk. Handl.*, no. 58 (1947), 150 pp.; *C.A.*, 44 (1950), 2727c.

Sulfates and chlorides are most commonly observed in salt efflorescence on masonry;  $\text{MgSO}_4$  and  $\text{MgCl}_2$  are the most dangerous; gypsum and  $\text{CaCO}_3$  disfigure the masonry. The tendency to form efflorescence is not directly proportional to the salt content of the building materials; not even a minimum amount of salts necessary for provoking efflorescence can be stated. Essentially important are the porosity and capillarity of the bricks and the intensity of the moisture effects.  $\text{CO}_2$ -containing rain water is particularly detrimental if its action takes place without long interruptions by dry weather. Moisture penetrates from the surface to the plaster on the inside of the wall, through wall-papers and paint carrying with it dissolved lime and soluble salts. Mold and bacterial colonies often appear. Coal smoke carrying  $\text{CO}_2$  and  $\text{SO}_2$  in the atmosphere is the principal reason for corrosion and efflorescence

even on century-old masonry. The foundations of the buildings are damaged by sulfate-containing underground waters; gypsum and Candlot's salt ( $3\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 2\text{CaSO}_4 \cdot 31\text{H}_2\text{O}$ ) are formed, which is particularly detrimental for portland cement, especially under the influence of  $\text{MgSO}_4$  in sea water.  $\text{NaCl}$  is detrimental if associated with  $\text{MgCl}_2$ ; the salt carried by the west winds on the Swedish coast is deposited on the masonry, is very hygroscopic, and impedes a thorough drying of the walls. High firing temperature of the bricks may be useful for suppressing efflorescence in the masonry but is not effective if gypsum is present. Admixtures of Ba compounds are recommended in this case. Fluosilicate application or painting the walls with bitumen reduces the moisture from penetration in the masonry and therefore suppresses efflorescence and frost damage. The best remedy, however, is good workmanship and careful handicraft in the production of the building materials and the construction itself. Glazed bricks with water-tight cement joints are profitable.

363. BISHOP, DANA L. Function of carbon dioxide in producing efflorescence on plaster and cement products. *J. Res. Nat. Bur. Stand.*, 30 (1943), pp. 361-366.

Hydrated magnesium sulfate identified as the principal constituent of efflorescence on plaster. The magnesia occurs in cements and in lime used in finish coats of plaster. Moisture and carbon dioxide are involved in the proposed chemical reactions. RLF

364. COGAN, H. D., and SETTERSTROM, C. A. Ethyl silicates. *Ind. Eng. Chem.*, 39 (1947), pp. 1364-1368; *C.A.*, 42 (1948), 519a.

A review of the esters of silicic acid which discusses physical properties, methods of manufacture, hydrolysis, alcoholic solutions, rates of reaction, and uses. The Et-silicates, the most widely used esters, are described in detail. These esters are useful in *adhesives for investments in precision casting, binders for ceramics, gelling agents for alcoholic fuels*, sources of finely divided amorphous silica, *weatherproofing*, and in the preparation of *glass-adherent lacquers*.

365. COGHAN, H. D., and SETTERSTROM, C. A. Properties of ethyl silicate. *Chem. Eng. News*, 24 (1946), pp. 2499-2501; *C.A.*, 40 (1946), 7156<sup>4</sup>.

For depositing a useful silica film  $\text{Si}(\text{OEt})_4$  should be blended with a mutual solvent in addition to the water necessary for hydrolysis. From 35 percent  $\text{EtOH}$ , 8 percent  $\text{H}_2\text{O}$ , 57 percent  $\text{Si}(\text{OEt})_4$ , 17.5 percent of  $\text{SiO}_2$  is deposited. For higher percentage deposition partially hydrolyze, and at least 8 hours before use add more water to complete the hydrolysis. Then evaporation of water and solvent gives the deposit. The partially hydrolyzed solution can be stored indefinitely and the completely hydrolyzed solution for at least a month. A common undistilled grade known as "condensed" Et silicate contains some polyethyl silicate, increasing the original  $\text{SiO}_2$  content from 28.8 to 31.5

percent. Et silicate 40 contains  $\text{SiO}_2$  40 percent. Hydrolysis is slow in neutral solution, rapid when alkaline, but controllably rapid when 0.3–5 percent of HCl is added. An application is for preservation of architectural stone against the elements. Hardness is increased and porosity decreased. As an adhesive it binds comminuted materials, as in making metal molds. Films are brittle and lack adhesion unless pigmented with an inert, and filled, as with micronized mica. Gels formed with an alkaline catalyst are useful solid fuels.

366. CUNNINGHAM, W. A., DUNHAM, R. M., and ANTES, L. L. Hydration of gypsum plaster. *Ind. Eng. Chem.*, 44 (1952), pp. 2402–2408, illus.

Photomicrograph and electron micrograph (up to 15,200x) studies were made of the setting of plaster of Paris. The hydration of plaster of Paris appears to be a solution-recrystallization process in which the hemihydrate dissolves and then crystallizes as needlelike gypsum crystals. The same type of crystals are formed in the solid set mass of plaster of Paris that are formed in dilute suspensions. The addition of the set-accelerating and set-retarding materials used affects the rate of solution of hemihydrate. No visual evidence was found of intermediate gel formation in the process of setting or hydration.

RJG

367. DEFORGE, J. Le ciment des Romains. *Rev. matériaux construction et trav. publ., Ed. C* (1949), pp. 17–18.

L'état des connaissances des Romains en matière de ciment, notamment en ce qui concerne l'emploi des pozzuolanes naturelles.

FD

368. DELMONTE, JOHN. Impregnation of plaster of Paris with plastics. *Chem. Met. Eng.*, 52 (1945), pp. 256–262; *Review*, 19 (1946), p. 152.

Plaster of Paris is impregnated with furan, phenolic, urea, and melamine resins to produce a material with properties comparable with ceramics.

369. EMBLEM, H. G. Silicon ester paints. *Paint Technol.*, 13 (1948), pp. 309–311; *C.A.*, 42 (1948), 8485.

Ethyl silicate may be hydrolyzed in the presence of alcohol and acid to form a coherent adhesive form of silica possessing unusual heat stability and durability. Such a product finds use as a concrete or stone hardener, preservative, and weatherproofing agent. In the matter of weatherproofing, modified Si esters have proved to be superior to linseed-oil emulsions, chlorinated rubbers, and fluosilicate base materials.

370. JERVIS, A. E. L. Ethyl silicate as a bonding agent in moldmaking. *Plastics (London)*, 11 (1947), pp. 358–360; *C.A.*, 42 (1948), 3295.

Molds for metal-casting at temps. up to 1600° are made by the lost-wax process from sillimanite and  $\text{Si}(\text{OEt})_4$ .



371. LIBERTI, SALVATORE. Efflorescenze bianche dannose ai dipinti che possono comparire nel caso di trasporti su cemento pieno e conglomerati cementizi. *Boll. ist. centrale restauro*, 1 (1950), pp. 21-25.

Trois types d'efflorescences: alcalis libres, nitrates, chlorures; leur formation et leurs méfaits. La preuve expérimentale de leur existence est fournie par des analyses exécutées sur des supports "d'Eternit." FD

372. LLEWELLYN, H. M., and ELDRIDGE, H. J. Painting new plaster and cement. *Dept. Sci. Ind. Research (Brit.) Natl. Bldg. Studies, Bull.*, 2 (1948), 22 pp.; *C.A.*, 44 (1950), 9654d.

The adverse effects of different paints on plaster and cement surfaces are discussed, and precautions for avoiding such failures which are invariably associated with the existence of damp conditions in either plaster or atmosphere are detailed. Contributory factors are (1) chemical action, e.g., between alkaline plasters and the oil or certain pigments in the paint; only "lime-fast" pigments should be used; (2) loss of specific adhesion caused, particularly in dense  $\text{CaSO}_4$  plasters of the Keene's type, by access of  $\text{H}_2\text{O}$  to the paint-plaster interface or, as exemplified by flaking and peeling of water paints and distemper, by repeated wetting and drying of the glue film; (3) efflorescence arising from outward movement of soluble salts in the bricks, sand, and cement of the mortar, plaster undercoat, or, more rarely, the plaster finish itself; tendency of plaster to effloresce depends more on size and distribution of pores than on their total volume, and may be minimized by suitable control of the plastering time-schedule; (4) defects in the plaster, e.g., particles of unslaked  $\text{CaO}$  which may subsequently cause "popping" or excess of  $\text{H}_2\text{O}$  in hemihydrate plasters causing early "sweating out"; dry-out and delayed expansion may occur in certain anhydrous plasters which have hydrated incompletely through too rapid drying in the early stages; and (5) mold growth, favored by dampness or presence of  $\text{SO}_4^{2-}$ -reducing bacteria; remedial measures comprise stripping and drying the infected area followed by treatment with 1 percent aqueous  $\text{C}_6\text{Cl}_5\text{ONa}$  or  $\text{NaOC}_6\text{H}_4\text{CONHPh}$ . Suitable porous coatings (distempers; flat oil-paints; cement, silicate, and "plastic" paints) are suggested for the early decoration of plaster and cement surfaces to obviate risk of failure through entrapment of excessive  $\text{H}_2\text{O}$ . The specific requirements of portland cement, lime plaster, and  $\text{CaSO}_4$  plasters as bases for priming and finishing coats of paint are summarized. Properties of  $\text{CaSO}_4$  plasters which affect painting most are chemical action, porosity, rate of hydration, and type of surface finish produced; optimum procedures for painting the various types are detailed. A list of available British proprietary  $\text{CaSO}_4$  plasters is appended.

373. SHAW, CLIFFORD. Application of ethyl silicate to foundry practice. *Proc. Brit. Inst. Found.*, 39 (1945/46), B99-104 (Paper no. 870); *C.A.*, 41 (1947), 5830.



A chemist explains to foundrymen what Si esters are and why they act as cements for refractory aggregates. Hot Si and Cl react to form  $\text{SiCl}_4$ , which reacts with dry absolute ethyl alcohol to form Si ester or  $\text{Si}(\text{OC}_2\text{H}_5)_4$ . In order to obtain a binder, the ester must be hydrolyzed. If a small amount of  $\text{H}_2\text{O}$  is used, such as that present in commercial alcohol, condensation takes place producing a series of complex ethyl silicates. When fully hydrolyzed the liquid is unstable and jells in a short time. The jelling time can be adjusted by the addition of alkali. In foundry practice the liquid is partially hydrolyzed and will set in about 15 minutes when commercial alcohol is added. The setting time can be varied between 5 minutes and 5 hours, according to the amount of  $\text{H}_2\text{O}$  added and the concentration of the condensing agent. The chemical is used in mold making in the manufacture of precision castings, but it can also be used to improve the surface of large castings. For economy, a composite mold having a varying thickness of the comparatively expensive mix at the surface meeting the metal would be backed up by cheaper materials.

374. Society of chemical industry, London. *Shrinkage and cracking of cementive materials*; symposium held by Roads and Building Materials Group on Aug. 5, 1946. Reviewed in *Nature (London)* 158 (1946), pp. 11–14, by F. M. L.

Includes papers on "swelling and shrinkage of porous materials and the role of surface forces in determining the technical strength of artifact materials" and on cracking of plastic clay articles during drying, setting, and expansion of plasters. LB

375. VASTAGH, GÁBOR, and IVÁN, ÉVA. The chemistry of the ancient Roman mortars of lime and powdered brick. *Magyar Kem. folyóirat*, 54 (1948), pp. 42–45; *C.A.*, 43 (1949), 9410.

Two samples of mortar from Roman ruins in Hungary contained particles above 2 mm., 81.08–86.40 percent; 1–2 mm., 3.05–5.15 percent; 0.5–1.0 mm., 2.60–3.14 percent; 0.25–0.50 mm., 2.68–2.84 percent; below 0.25 mm., 2.63–10.43 percent. A Roman brick contained  $\text{SiO}_2$  55.02,  $\text{Al}_2\text{O}_3$  21.67 percent,  $\text{Fe}_2\text{O}_3$  11.39,  $\text{CaO}$  8.32, and  $\text{MgO}$  3.37 percent; loss on ignition was 5.43 percent. Roman bricks and modern Hungarian bricks were crushed to grain sizes 0.5–2.0 mm., moistened with water, treated with lime paste, and made into small bricks. These were stored for 27 months alternately in dry air and in air saturated with vapor. Examination showed that 100 g.  $\text{CaO}$  had dissolved from the brick 1.28–3.93 g.  $\text{SiO}_2$  and 4.45–11.04 g.  $\text{Al}_2\text{O}_3$ . The  $\text{SiO}_2$  and  $\text{Al}_2\text{O}_3$  may have diffused into the lime paste and become bound as Ca silicate and Ca aluminate; this makes the whole mass impermeable to water.

376. YAMASAKI KAZUO. The black substance on the floor of the pagoda and on the panel stones of the platforms of the pagoda and the Golden Hall of the Hōryūji temple. *Sci. Pap. Japn. Antiques*, no. 4 (1952), pp. 20–22.

The layer of the black substance was found between the mortar layer and the clay which forms the floor of the interior of the pagoda of the Hōryūji Temple. This was found to contain 55.50 percent  $\text{MnO}_2$  and is supposed to be manganese wad. The panel stones of the upper platforms of the pagoda and the Golden Hall were also coated with black substances which were found to be manganese wad. Their  $\text{MnO}_2$  contents were 38.12 and 50.52 percent, respectively. The reason for the presence of these black substances is unknown. KY

## F. METALS AND METALLURGY

### 1. HISTORY

377. ABSOLON, K. A cast-iron ring 2500 years old; further discoveries in the Býčí Skála cave. *I.L.N.*, 209 (1946), pp. 592-595.

The report of a discovery of a cast iron ring which claims to revise drastically the previously held belief that iron casting was not discovered until the fourteenth century A. D. MB

378. ANASTASIADIS, E. Bronze welding, riveting, and wiremaking by the ancient Greeks. *Metal progress*, 58 (1950), pp. 322-324; *C.A.*, 44 (1950), 9909.

Chemical and microscopic examinations of ancient art objects show high purity of bronze and sound microstructure.

379. ASAHINA TEIICHI 朝比奈貞一. On the bell of the old Japanese clock. *Sci. Pap. Japn. Antiques*, no. 3 (Jan. 1952), pp. 8-15.

The tones of bells of 106 old Japanese bronze clocks preserved in the National Science Museum, Tokyo, were studied and found to be pitched to tunes of Japanese music. Samples from two broken bells contained zinc, silver, bismuth, magnesium, calcium, titanium, antimony, and silicon in traces. KY

380. AYLWARD, J. D. A problem of the past investigated. *Edg. Allen News*, 26 (1948), pp. 977-980; *J. Iron Steel Inst. (London)*, 158 (1948), p. 413.

The methods by which the elaborately decorated steel sword hilts of the past were produced are discussed. The writer considers that many of them were wrought but that some were cast by the lost-wax process at an early stage in their manufacture.

381. AYLWARD, J. D. Sword ornaments. *Edg. Allen News*, 26 (1948), pp. 980-981; *J. Iron Steel Inst. (London)* 158 (1948), p. 412.

A short report is made on a metallographic examination of some eighteenth-century sword ornaments.

382. BARREIRO, L. History of the manufacture of tinplate. *Bol. min. indus.*, 28 (1949), pp. 437-438; *J. Iron Steel Inst. (London)*, 166 (1950), p. 165.

Manufacture of tinplate commenced about 1600 in central Europe. An Englishman, Andrew Yarranton, studied the process in Bohemia and brought back plans to England for producing tinplate in Wales, based on local tin and the ores of the Forest of Dean and Irish charcoal. His plans did not succeed, and it was not until 1720 that John Hanbury started up a plant at Pontypool. Spain began the production of tinplate in 1892 at the La Iberia works now belonging to the Altos Hornos de Vizcaya.

383. BEARZI, B. La metallurgia nella antichità. *Metallurgia ital.*, n° 6 (giugno 1951), pp. 3-8, 17 illus.

Conférence faite par l'auteur et dans laquelle il aborde certains problèmes qui se posent à l'observation des techniques anciennes. DG

384. BELAIEW, N. T. Oriental "Damask" and the Damascus swords. *Mé-taux et Civil.*, 1 (1945), pp. 10-16; *J. Iron Steel Inst. (London)*, 157 (1947), p. 653.

The author reviews the history of Damascus steel and its introduction into Russia. He describes the manufacture and qualities of this steel and gives a short bibliography.

385. BIRINGUCCIO, VANNUCCIO. *The Pirotechnia of Vannuccio Biringuccio*. Tr. from the Italian, with an introduction and notes by Cyril Stanley Smith and Martha Teach Gnudi. . . . New York, American institute of mining and metallurgical engineers, 1942. xvii, 476 pp., illus.

Contents: Introduction; Bk. I. Every kind of mineral, in general; Bk. II. The semiminerals; Bk. III. Assaying and preparing ores for smelting; Bk. IV. The separation of gold from silver; Bk. V. The alloys that are formed between metals; Bk. VI. The art of casting in general and particular; Bk. VII. Methods of melting metals; Bk. VIII. The small art of casting; Bk. IX. The procedure of various works of fire; Bk. X. On certain artificial combustible materials, and the procedures followed in making fireworks to be used in warfare and for festivals; App. A. Figures; App. B. Weights and measures; App. C. List of editions of the *Pirotechnia*; App. D. Bibliography; Index.

Reviewed in: *Chem. Eng. News*, 20 (Dec. 10, 1942), p. 1600, by Max Hirsch; *Library J.*, 68 (Ap. 1, 1943), p. 290; *N. Y. Herald Tribune Bks.*, Jan. 24, 1943, by James Stokley. BMU

386. BRAILSFORD, JOHN. A founders hoard from Dartford, Kent, with a note on socketed bronze swords. *P.P.S.*, 13 (1947), pp. 175-177.

Discussion of the use of "dummy" rivet holes.

IG

387. BRENTZ, P. L. Metallurgy in Africa. *Iscor News*, 15 (1950), pp. 771-775, 781; *J. Iron Steel Inst. (London)*, 167 (1951), p. 469.

The manufacture of iron by native Africans is surveyed. An intensive iron industry which had developed from the eighth century A. D. was still flourishing in the days of the Portuguese explorers. In marked contrast to the honored status enjoyed by smiths among the Bantu and Sudanese, metalworkers are generally despised among Hamitic-peoples of the north and the northeast who look down upon physical work of any kind. Early brands of iron were highly phosphoric and brittle. The ores were first roasted in the open air to oxidize the sulfur to sulfurous acid. The iron was cooled very slowly in African smeltings, a crust of graphite and iron carbide being precipitated. The Africans normally produced iron more suitable for forging than for casting. The temperature reached in native furnaces was not high enough to effect proper smelting of the ore which merely formed a spongy mass, gradually losing the excess carbon and becoming an amorphous, cindery iron lump. In some regions, e.g., Togoland, furnaces are 7 to 10 feet high so as to cause a draught through the stack without the use of bellows.

Most "large" African furnaces are based on the principles applied in Europe up to the eighteenth century. They are built of clay and usually do not survive more than one or two smeltings.

388. BROMHEAD, C. E. N. Practical geology in ancient Britain. I. The metals. *Proc. Geol. Assoc.*, 58 (1947), pp. 345-367; *C.A.*, 42 (1948), 2895i.

Historical data on mining and metallurgy of Sn, Cu, Pb, Fe, and Au.

II. Non-metals. *Ibid.*, 59 (1948), pp. 65-76; *C.A.*, 42 (1948), 2895g.

Clays, coal, and precious stones are discussed.

389. CALEY, EARLE R. The earliest known use of a material containing uranium. *Isis*, 38 (1948), pp. 190-193.

Attention is called to an analysis of a pale yellow-green glass tessera from a Roman mosaic reported by J. J. Manley of Oxford University many years ago ("Analysis of Green and Blue Glass from the Posilipan Mosaic," *Archaeologia* 43 (1912), pp. 106-108). This glass contained 1.5 percent of uranium dioxide which appears to account for its yellowish-green color. It is more probable that a uranium mineral was intentionally added to the glass batch than that the uranium was derived from use of an uraniferous sand.

RJG

390. CALEY, EARLE R. The prehistoric use of arsenical copper in the Aegean region. *Hesperia*, 20, Supp. 8 (1949), pp. 60-63; *C.A.*, 43 (1949), 2825.



A Helladic needle from Corinth was found to contain 2.52 percent As. Similar proportions of As have been found in early Cu objects from other sites but not in Sn bronzes of later date.

391. CHILDE, V. GORDON. A bronze-workers anvil and other tools recently acquired by the Inverness Museum, with a note on another Scottish anvil. *Proc. Soc. Ant. Scotland*, 80 (1945), pp. 8-11.

Description and spectrographic analysis of the metal in the anvil by Dr. Morsrai Ritchie. It is a rich bronze. IG

392. CLARKE, R. RAINBIRD. A hoard of metalwork of the early Iron Age from Ringstead, Norfolk. *P.P.S.*, 17 (1951), p. 214.

Description of the manufacture of bridle-bits and plates and rivets. IG

393. COGHLAN, H. H. *Notes on the prehistoric metallurgy of copper and bronze in the Old World*. London, Oxford university press, 1951. 131 pp., 16 pls. (Pitt Rivers Museum. Occasional papers on technology, no. 4.)

Contents: I. Native copper and the ores from which prehistoric non-ferrous metals were obtained. II. Discovery of nonferrous metals in antiquity. III. Sequence of the metals. Analysis and metallography as means of distinguishing the various metals. IV. Mechanical properties of copper and bronze. V. Casting process: furnaces, bellows and crucibles. VI. Methods of working the metals. VII. Results of metallurgical examination. VIII. Examination of specimens from the Pitt Rivers Museum, by Voce, E. IX. Bronze castings in ancient molds, by Voce, E. X. Analyses of native copper and artifacts. XI. Note on specimens in the Pitt Rivers Museum illustrating *cire perdue* casting; seventy references; index. LB

394. COGHLAN, H. H. Some fresh aspects of the prehistoric metallurgy of copper. *Ant. J.*, 22 (1942), pp. 22-38, illus.

With aid of diagrams traces course of the development of primitive copper metallurgy as indicated from finds at Tepe Sialk near Kashan in Mesopotamia. The first clear evidence of true bronze intentionally made occurs in the Royal tombs at Ur where we suddenly find a sophisticated bronzeworking technique. RJG

395. COLLON-GEVAERT, SUZANNE. *Histoire des arts du métal en Belgique*. *Mém. acad. roy. belg., Classe beaux-arts*, 7 (1951), 476 pp., 109 pl. hors-texte.

Renseignements historiques et techniques dans le corps des chapitres et à la bibliographie. Les chapitres sont: Age du bronze; Age du fer; période belgo-romaine; orfèvrerie barbare; les siècles pauvres de l'orfèvrerie; le XII<sup>e</sup> siècle ou l'âge d'or mosan; orfèvrerie du XIII<sup>e</sup>; travail du cuivre du XIV<sup>e</sup> au XVIII<sup>e</sup> siècle; le régime corporatif; la ferronnerie d'art; l'étain; le plomb en art. Glossaire. DG



396. COMFORT, HOWARD. A hoard of Greek jewelry. *Amer. J. Archaeol.*, 54 (1950), pp. 121-126; *C.A.*, 44 (1950), 8709.

Fragments of gold leaf contained 80.25 percent Au, 12.45 percent Ag, 0.001 percent Cu, and 7.3 percent impurities. A silver ring contained 60.48 percent Ag and a trace of Au.

397. CRIVELLI, E. Cassiteros and tin. *Chim. ind. agr. biol.*, 17 (1941), pp. 575-584; *Chem. Zentr.*, Pt. 2 (1942), p. 2454; *C.A.*, 38 (1944), 2912.

Homer mentioned a metal *κασσιτερος* which was later designated by Pliny as "plumbum album" and was evidently Sn. The author discusses the history of Sn, its use in white enamels, alloys, etc., the development of commerce in cassiterite and the names for Sn in various languages.

398. DAVIS, FRANK. Fruits of a considerable industry. *I.L.N.*, 220 (1952), p. 267.

An article on Sheffield plate, with an account of the method of manufacture. MB

399. DELBART, G. Iron and steel metallurgy through the ages. *Fond. belgique*, 22 Octobre, 1943; *J. Iron Steel Inst. (London)*, 159 (1948), p. 350.

The author traces the history of the metallurgy of iron and the methods of manufacture from the earliest times. The second part of the paper deals with the history of the metallurgy of iron and steel.

400. DOAR, R., and EVRARD, R. Three centuries of cast iron metallurgy. *Amer. Foundrym.*, 20 (1951), pp. 58-60; *J. Iron Steel Inst. (London)*, 171 (1952), p. 116.

About 50 iron castings from Belgium and Luxembourg made in the period 1500-1920, 11 from France made between 1547 and 1738, and some sixteenth century British castings have been examined; the changes in C/Si ratio over these periods are discussed.

401. DUNHAM, DOWS. Notes on copper-bronze in the Middle Kingdom. *Egypt. Archaeol.*, 29 (1943), pp. 60-62, 1 plate.

Spectrographic analyses were made of 11 copper and bronze objects from Kerma (above the Third Cataract) and 8 from Middle Egypt. Of these 19 pieces, 15 are copper (contain less than 2 percent tin) and 4 are bronze (contain more than 2 percent tin). Although the number of specimens dealt with is too small to warrant drawing definite conclusions, it seems that no very conscious discrimination was made between copper and bronze (copper-tin alloy) in respect to the functions to be performed by the metal object. RJG

402. ENSKO, STEPHEN G. C. *American silversmiths and their marks*. New York, Priv. print., Robert Ensko inc., 1948. 285 pp., illus., fold. maps.

Contents: Introduction; Acknowledgments; Names of early American silversmiths, 1650–1850; Marks of early American silversmiths, 1650–1850; Location of silversmiths' shops; Bibliography. BMU

403. EVANS, E. ESTYN. Strange objects from County Fermanagh. *Ulster J. Ant.*, 11 (1948), pp. 58–64.

Description of three V-shaped lumps of iron, possibly "prepared blooms" split before cooling. Also a description of the macrostructure and microchemical analysis of drillings from the lumps and a spectrographic analysis. IG

404. EVRARD, RENÉ, et DESCY, ARMAND. *Histoire de l'usine des Venues suivie de considérations sur les fontes anciennes*. Liège, Solédi, 1948. 381 pp., 146 illus.

Au point de vue technique et historique: La métallurgie du Fer au Pays de Liège jusqu'au 16<sup>e</sup> siècle; Les fontes anciennes comparées aux modernes; Les fontes de moulage ordinaires, d'affinage, de minerais imprégnés, les poteries; Les fontes pour pièces massives et pour pièces dures; Du fer des bas-foyers aux fontes de moulage modernes; Les fonderies des Venues (Belgique) et l'évolution technique. En annexe: un essai de détermination de l'âge des pièces en fonte avec tableau d'analyse de quatorze objets datant du 16<sup>e</sup> au 19<sup>e</sup> siècle. DG

405. FARNSWORTH, MARIE, SMITH, CYRIL STANLEY, and RODDA, J. L. Metallographic examination of a sample of metallic zinc from ancient Athens. *Hesperia*, Suppl. 8 (1949), pp. 126–129; *C.A.*, 43 (1949), 2825.

Analysis of a plate of metal found at Athens along with coins and other objects dating from the fourth to the second centuries B.C. showed it to be nearly pure Zn. Though the plate may be of later date, the structure indicated that it was not produced by modern methods.

406. FORBES, ROBERT JAMES. Ancient history of metals. *Ingenieur*, 56 (1941), pp. 31–34; *C.A.*, 37 (1943), 1632.

Discusses the Bronze Age in particular.

407. FORBES, ROBERT JAMES. Materials that were known 3300 years ago. *Chem. Weekblad.*, 37, no. 6 (1940), p. 43; *C.A.*, 36 (1942), 4377.

An Egyptian diplomatic document that gives some information on the metallurgy of the time is described.

408. FORBES, ROBERT JAMES. Metaal en metaalbewerking in mythe en maatschappij. *Mensch maatschappij (Amsterdam)*, 18e jaar., n<sup>o</sup> 1, 30 pp.

Historique du travail du métal: les forgerons en Afrique, en Indonésie, leurs traditions; arrière-plan technique du forgeage; la découverte des minerais; la situation sociale du forgeron, sa position dans le

Moyen-Orient et en Egypte; raccord entre la mythologie et l'histoire; la migration des forgerons du fer; origines d'après les données archéologiques. 65 références. DG

409. FORBES, ROBERT JAMES. *Metallurgy in antiquity; a notebook for archaeologists and technologists*. Leiden, E. J. Brill, c1950. 489 pp., 98 illus.

Contents: A note to the reader; Synopsis of early metallurgy; Short historical survey of early mining; The evolution of the smith, his social and sacred status; Tools and methods of early metallurgy; Gold in the ancient near east; Silver and lead in antiquity; Tin, antimony, and arsenic in antiquity; Zinc and brass in antiquity; Copper in the ancient near east; The early story of iron; Old methods and new tools; Index. Includes bibliographies at end of each chapter.

Reviewed in: *Isis*, 43 (1952), p. 283, by Cyril Stanley Smith; *Conservation*, 1 (Oct. 1952), pp. 45-46, by D. Goorieckx; *Journal of Near Eastern Studies*, 12 (1953), pp. 290-293, by C. Hillen. BMU

410. FOX, F. A. Sidelights on the early history of some metals. *Sheet Metal Indus.*, 26 (1949), pp. 347-351, 357; *J. Iron Steel Inst. (London)*, 162 (1949), p. 373.

Some incidents revealing the early history of the production and use of metals are described. With regard to iron it is stated that a storehouse containing about 160 tons of forged iron bars, most of them up to 6 inches thick and up to 20 inches long, was found in the ruins of the palace of an Assyrian King, built about 710 B. C.

411. FRANCE-LANORD, ALBERT. The fabrication of 'Damascened' swords in the Merovingian and Carolingian periods. *Pays Gaumais*, 10, nos. 1-2-3 (1949); *J. Iron Steel Inst. (London)*, 164 (1950), p. 509.

By the macro- and micro-examination of longitudinal and transverse sections of a "damascened" sword and comparison of the appearance of the surface with those of other swords of these periods, the author was able to establish that the ornamental pattern was not produced by welding a filigree pattern on to the surface but was the external trace of the laminated structure of the steel itself. The laminations consist of pure iron and light carburized iron, and the mode of manufacture by welding together these strips of surface carburized iron to form a sandwich and then folding back and forth to form close loops, rewelding, forging to shape, and finally welding on the (unpatterned) cutting edges is described.

412. FRANCE-LANORD, ALBERT. Les techniques métallurgiques appliquées à l'archéologie. *Rev. mét.*, 49 (1952), pp. 411-422, 4 illus., 9 pl.

Attaques macrographiques et reconstitution des procédés de fabrication du damas soudé. La cémentation nitrurée, l'historique des lames d'épées. Caractéristiques principales des épées damassées et moyens d'investigation. DG

413. Freer gallery of art, Washington, D. C. *A descriptive and illustrative catalogue of Chinese bronzes acquired during the administration of John Ellerton Lodge* . . . 1946. 108 pp. illus., maps., (*Its Oriental studies*, no. 3.)

Contents: Introduction; Chronology; Bibliography; List of plates; Bronzes listed in numerical order; Catalogue; Index.

Reviewed in: *Artibus Asiae*, v. 11 (1948), pp. 148–152, by Laurence Sickman; *Nature (London)*, 159 (1947), p. 282, by Basil Gray; *Phoenix (Amsterdam)*, jaar. 1, nr. 11 (1947), pp. 27–28. BMU

414. GAUL, JAMES H. Possibilities of prehistoric metallurgy in the East Balkan Peninsula. *Amer. J. Archaeol.*, 2s. 42 (1946), pp. 400–409.

A factual treatment with map and selected bibliography. Lists are given with place names of mines and mineral resources, mounds, and caves. The Balkans are richly mineralized and there is abundant evidence of a metallurgy going back to the end phases of the Neolithic Period. RJG

415. GOORIECKX, DENISE, et PEETERS, RAYMOND. De behandeling der Frankische gespen van Lutlommel. *Taxandria (België)*, 16 (1951), 4 pp., 3 pl.

Mise en évidence des damasquinures d'argent sur des boucles en fer de l'époque franque. DG

416. HASKINS, JOHN F. Northern origins of "Sasanian" metalwork, Part I—*Artibus Asiae*, 15 (1952), pp. 241–267, illus., map, geneal. tab., diagrs.; Part II. *Ibid.*, pp. 324–347, illus.

417. HILL, DOROTHY KENT. Ancient metal reliefs. *Hesperia*, 12 (1943), pp. 97–114.

A study of examples of Classical metal reliefs showed that hammered relief was used throughout antiquity in Greece and Italy. Repouseé was apparently discovered in the second half of the fifth century and remained in use until at least the third century. Cast low relief was used at all periods, but hollow cast relief was used only in Hellenistic and early Roman times. Cast reliefs were made in imitation of hammered reliefs with the aid of matrices that were also molds, and from repouseé with the aid of clay impressions. ERC

418. HILL, DOROTHY KENT. More about ancient metal reliefs. *Hesperia*, 13 (1944), pp. 87–89. Some corrections and further explanations are given (Cf., *Hesperia*, 12 (1943), pp. 97–114). ERC

419. HILL, DOROTHY KENT. The technique of Greek metal vases and its bearing on vase forms in metal and pottery. *Amer. J. Archaeol.*, 51 (1947), pp. 248–256.

Prior to the sixth century B. C. metal vases were produced solely by hammering. At about the beginning of the sixth century cast bases,



rims, and handles were sometimes attached by riveting or welding. By the fifth century the bodies of vases were also frequently cast. Casting of bodies was not always by the *cire perdue* process, for sometimes the parts of a vessel were cast separately and then joined. Cast vases were usually finished by turning on a lathe, both for the purpose of imparting decoration and for polishing. It is doubtful that metal vases very often served as prototypes for pottery vessels of similar shape. ERC

420. HOPKINSON, G. Prehistoric iron; new finds indicate early B. C. smelting. *Iron & Steel (London)*, 23 (1950), p. 152; *J. Iron Steel Inst. (London)*, 168 (1951), p. 334.

A brief description is given of the discoveries at Norton, Sheffield, indicating prehistoric smelting of iron. The finds include three slag mounds and a smelting pit. These are of high archeological significance.

421. HURST, J. E., and RILEY, R. V. A metallurgical examination of a cast iron cannon ball. *Inst. Brit. Foundrym. Papr.*, no. 946 (June 14-17, 1949); *J. Iron Steel Inst. (London)*, 163 (1949), p. 366.

The authors give an account of their examination of a 300-year-old cast-iron cannonball. They examined the nature and reason for internal unsoundness, the chemical composition and gas content of the iron, and carried out metallographic examinations.

422. JARES, V. Is the prehistoric ring of Býčí Skála from cast iron? *Hutn. List.*, 2 (1947), pp. 128-129; *J. Iron Steel Inst. (London)*, 158 (1948), p. 413.

The author presents evidence that the ring of the sixth century B. C. was not cast but was drop-forged in dies in two halves and then fire-welded.

423. JOHNSON, P. Early iron making in northeast Scania. *Bl. Bergbendt. Örebro*, 4 (1949), pp. 297-301; *J. Iron Steel Inst. (London)*, 168 (1951), p. 445.

In 1948 remnants of smelting furnaces and a workshop were discovered in a Scanian forest. Bog iron ore was used as a raw material for weapon manufacture in those areas some four centuries ago.

424. JOPE, E. M. An inlaid knife from Winchester. (Late Roman). *Ant. J.*, 26 (1946), pp. 70-72.

The following technical processes are described: "In the first a wire or suitably shaped piece of the inlay metal was beaten into a previously prepared hollow in the body." This is the case with the Winchester knife. "In the second a sheet of inlay metal was beaten into the body, which was previously scored with the pattern, and then cut away so that the body surface underneath showed up the design." IG

425. KELLY, JOHN E. The history of Spanish quicksilver. *Mining J. (Phoenix, Ariz.)*, 29, no. 14 (1945), pp. 8-9.



The principal cinnabar mines in Spain are at Almaden del Azogue in the province of Ciudad Real south of Madrid. These are among the oldest worked mines in the world. They were taken from the Celt-Iberian aborigines by the Carthaginians and in turn by the Romans who worked them with slave labor. The deposit is of great extent and in over 2,000 years of continuous operation it has hardly been touched. After seven centuries of operation by the Moors the mines have passed through many hands. They are now a state monopoly. Modern ore roasting methods have been installed with the result that poisoning of workers by mercury vapors has been much reduced. In 1939 exports totaled 53,400 76-pound flasks. RJG

426. KELSO, J. L. Some sixteenth-century copper objects from Tell Beit Mirsim. *B.A.S.O.R.*, no. 91 (1943), pp. 28-36.

Through the courtesy of R. J. Frank, vice-president of the Copperweld Steel Co., and L. C. Whitney, metallurgist, an adz head and a mace head from this site were analyzed chemically and studied metallographically. Both were found to be nearly pure copper. The adz head was evidently produced by casting with subsequent hot and cold working. The mace head had a coarse cast structure with no indication of working. Excellent photomicrographs illustrate the structure of these objects and the extent of corrosion. ERC

427. LABORDE, M. The part played by the region of Guipuzcoa in the history of the Spanish iron and steel industry. *Dyna*, 24 (1949), pp. 257-264; *J. Iron Steel Inst. (London)*, 164 (1950), p. 253.

The author briefly traces the various civilizations in Spain and their effects, leading up to the introduction of mining and metal working from the East, and outlines events in Guipuzcoa from the fourteenth century. Slags from the ancient ironworks, found by the author in the mountainous regions, confirm the existence of these works mentioned in old Basque documents. The slags are not spongy but vitreous, and appear to have been exceptionally fluid. The Guipucoans probably used charcoal for smelting and added a flux. The development of the organization of metallurgy in Guipuzcoa is subsequently described up to the beginnings of the nineteenth century.

428. LAMARRE, HENRI. La cachette de fondeur de Longueville (Seine-et-Marne). *Rev. archéol.*, Sr. 6, 23 (1945), pp. 98-115.

A hoard of prehistoric bronze objects and fragments of such objects is described. Their total weight amounted to 12.5 kilograms. The nature of the collection and the inclusion of fused cakes of metal indicated the hoard of a metalworker. Quantitative analyses of metal from three of the objects were made for the author by the Laboratoires P. Dubois of Paris. The bronze was found to vary much in composition, since the tin content ranged from 2.92 percent to 10.18 percent, and the lead content from 0.31 percent to 3.01 percent. Various impurities were found. ERC

429. LEROI-GOURHAN, A. Notes on the history of steel. *Tech. et Civil.*, 2 (1951), pp. 4-10; *J. Iron Steel Inst. (London)*, 168 (1951), p. 445.

A comparative description is given of various types of swords and daggers of various ages from different parts of the world, with particular reference to irregularities and the designs on their blades.

430. LIANG SHU-CHUAN, and CHANG KAN-NAN. The composition of some early Chinese bronzes. *Science Tech. China*, 2 (1949), p. 33; *C.A.*, 43 (1949), 8335f; *J. Chinese Chem. Soc.*, 17 (1950), pp. 9-17; *C.A.*, 44 (1950), 4851g.

Analyses are reported for 44 specimens of bronze from the Yin and Chou periods (1401-249 B.C.).

431. LIGHTNER, M. W. Analysis of iron implements from Tell Beit Mirsim. *B.A.S.O.R.*, no. 119 (Oct. 1950), pp. 22-23.

Spectrographic estimates are tabulated for 23 elements in five samples of lime-encrusted iron implements from Palestine that are believed to date about the seventh century B.C. Quantitative analysis on a plough share gave:  $\text{SiO}_2$  0.58;  $\text{MnO}$  0.023;  $\text{P}_2\text{O}_5$  0.077; S 0.032; (as  $\text{SO}_4$  or S) C (as  $\text{CO}_3$ ) 0.45;  $\text{Fe}_2\text{O}_3$  90.76;  $\text{Al}_2\text{O}_3$  0.36;  $\text{NiO}$  0.12; remainder mostly  $\text{CaO}$ . The low Ni and Co content indicate that the iron is not of meteoric origin. All samples are slightly magnetic indicating that the Fe is nearly completely oxidized. RJG

432. LOEHR, MAX. The earliest Chinese swords and *akinakes*. *O.A.*, 1 (1948), pp. 132-142, illus.

Structural design and development of early bronze swords in China and their importance as a means of dating. RMM

433. LOTHROP, SAMUEL KIRKLAND. *Metals from the Cenote of Sacrifice, Chichen Itza, Yucatan* . . . with sections by W. C. Root and Tatiana Proskouriakoff and an appendix by William Harvey. Cambridge, 1952. 139 pp., illus., pls., tables. (Peabody Museum of archaeology and ethnology, Harvard university. Memoirs, v. 10, no. 2.)

Contents: Introduction; Objects of sheet gold from the Cenote of sacrifice; Artifacts of gilded sheet copper; Artifacts of cast copper; Objects of cast gold; Discussion; App. I. Metallographic examination of gilded sheet copper and wirelike bells, by William Harvey; App. II. Metallurgical tools and materials; References; Index. BMU

434. MANTELL, CHARLES L. *Tin; its mining, production, technology* . . . and applications. 2d ed. New York, Reinhold pub. corp., 1949. x, 580 pp., illus., maps (American chemical society. Monograph series, no. 51).

Contents: 1. History: Primitive smelting, Early uses, sources; 2. Physical and chemical properties of the metal: Physical characteristics, Allo-

tropic forms, Chemical characteristics, Physiological action . . . 11.  
 Constitutional thermal diagrams of binary alloys . . . 17. Corrosion  
 . . . Restoration of bronzes. RJG

435. MARSHALL, KENNETH. Cast bronze cauldrons of mediaeval type in Belfast City Museum. *Ulster J. Ant.*, 13 (1950), pp. 66-75.

Description of possible methods of casting. IG

436. MARYON, HERBERT. Metal working in the ancient world. *Amer. J. Archaeol.*, 53 (1949), pp. 93-125; illus.

The development of the craft of the metalworker in antiquity is traced from the simple processes of sinking, raising, shaping, turning, spinning, riveting, welding, sintering, and soldering through the more complex processes of decorating like tracing, engraving, inlaying, and repoussé. The processes are illustrated with diagrams. Examples are drawn mainly from Europe and the Near East. The author discounts shaping of bowls by hammering over a turned or carved wooden pattern; he does not believe that repoussé was hammered over carved designs in wood. He points out that contrary to the beliefs of many archaeologists copper and its alloys cannot be pressure welded either cold or hot. So-called welded joints are often over-fired soldered joints. The subject of soldering is discussed with the aid of phase equilibrium diagrams. RJG

- 436a. MARYON, HERBERT. The Mildenhall Treasure; some technical problems. Part I. *Man*, 48 (Mar. 1948), pp. 25-27; Part II. *Ibid.*, (Apr. 1948), pp. 38-41, illus., diagrs.

The several silver dishes in the Mildenhall Treasure (British Museum) were examined for methods of technical execution. They form a fairly closed group. The dishes were formed from a cast circular ingot about one-tenth inch thick and the design was not done in repoussé from the back but was modeled and chased from the front. The surface of all works had been scraped before polishing. The beads of the beaded edges are hollow and were formed by driving up from the back with a round-headed punch. The general methods of fine metal working are reviewed. RJG

437. MARYON, HERBERT. The Sutton Hoo helmet. *Antiquity*, 21 (1947), pp. 137-144.

Description of the reconstruction of the helmet and methods of fabrication. Details of decoration and casting and materials used—iron, silver, gilt, niello, etc. IG

438. MARYON, HERBERT. The Sutton Hoo shield. *Antiquity*, 20 (1946), pp. 21-30.

Evidence for the reconstruction, etc. IG

439. MARYON, HERBERT. A sword of the Viking period from the river Witham. *Ant. J.*, 30 (1950), p. 175.

An examination of the scale on the blade and the technique used in making the inscription. Also identification of fresh-water algae (*Zygnemaceae*) found on the blade, by F. E. Zeuner. IG

440. MECQUENEM, R. DE. The use of metals by the Susanehte civilisations. *Métaux et Civil.*, 1 (1946), pp. 77-88; *J. Inst. Metals. Metallurgical Abs.* 73/74 (1947).

A detailed report of metallic specimens excavated from the site of Susa, near the head of the Persian Gulf. A number of the specimens are illustrated. Evidence suggests that vases, plates, mirrors, weapons, and ornaments made of copper date from 2800 to 2500 B. C. A representative sample from a horse harness contained 98.5 percent copper, with 0.12 percent nickel, 1.34 percent iron and traces of tin, arsenic, antimony, and silver. Molds for casting lance, spear, and arrowheads were excavated (1500 B. C.). At about 2700 B. C. bronze appeared, probably imported; specimens analyzed contained 8 to 12 percent tin. Gold ornaments (2300-2200 B. C.) were unearthed; and articles of silver were found, belonging to about the same period. Lead appears to have been used at the same date as gold and silver with a purity of 99.8 percent. At about 1000 B. C. iron appeared in Susa (arrowheads and rings), but was rare, though of high purity. The technical achievement of the metal workers of the town of Susa which changed hands and suffered sieges and pillages many times is discussed.

441. NEUMANN, B., and KLEMM, H. A metallographic investigation of iron dowels and bars from the 2200-year-old temple of Artemis at Maänder, in Magnesia (Asia Minor) and of a prehistoric iron chisel from near Wittenberg. *Archiv. Metallkunde* 3, (1949), pp. 333-334; *C.A.*, 44 (1950), 7103.

The marble columns of this famous temple were held together by iron dowels. Square rods were also used. These were reported on by Hallbauer (*Stahl u. Eisen* 1894, 984). The iron was presumably made in a blooming hearth. H. reports that it could not be rolled and that it broke under the hammer. It is not homogeneous and resembles a mixture of steels rather than wrought iron. A dowel, when cut, polished and etched appears as a very pure wrought iron with some spots that contain C. Its Brinell hardness corresponds to a good wrought iron. A hard spot showed pearlite and cementite corresponding to about 1.2 percent C. The bar broken by the hammer showed part made up of ferrite with slag inclusions; the other part, slag free, contained ferrite and pearlite. The slag appears to be iron silicate supersaturated with oxide (cf. *Archiv. Metallkunde* 3, 7 (1949)). The ancient Grecian dowel was compared with a chisel-type tool found at Annaburg, near Wittenberg. The chisel showed very fine slag inclusions, fibrous in form, due to forging. The chisel showed about 0.25 percent P, in agreement with other prehistoric irons found in north Germany, but prehistoric irons from central Europe show very little P. Difference in P content is attributed to differences in the ores of the two sections.



442. O'KELLY, M. J. Excavation of a ring fort at Garryduff, County Cork. *Antiquity*, 20 (1946), pp. 122-126.

Description of the method of manufacture of a gold bird and of the solder used. IG

443. OLDEBARG, ANDREAS. *Metalltechnik under förhistorisk Tid*. Lund, 1942-43. 2 vols.

Reviewed in: *Antiquity* 22 (Mar. 1948), 29-43 under the title: "The technique of prehistoric metal work," by V. Gordon Childe. RMO

444. O'NEILL, H. Metal founding through the ages. *Inst. Brit. Foundrym. Foundry Trade J.*, 86 (1949), pp. 575-581; *J. Iron Steel Inst. (London)*, 163 (1949), p. 366.

The ancient history of cast metals is discussed, reference being made to the distribution of finds of prehistoric moulds in the British Isles. The history of founding is reviewed with special mention of work in cast iron and the use of coal before the Christian Era and with reference to the modern developments of casting centrifugally, continuously, and in dies.

445. OTTO, HELMUT. Die chemische Zusammensetzung von bronzezeitlichen "Bronzen". *Naturw. Rundschau*, 3 (1949), pp. 106-110, 5 illus.

Composition et propriétés des alliages préhistoriques à base de cuivre. Evolution de la technique métallurgique. DG

446. OTTO, HELMUT. Typologische und technologische Bronzezeit. *Forschungen u. Fortsch.*, 25 (1949), pp. 73-76.

Rapport entre la délimitation des périodes de l'âge du bronze d'après les données typologiques et la classification adoptée par l'auteur se basant sur la composition d'un grand nombre d'objets. Importance de la recherche simultanée dans les deux domaines. DG

447. OTTO, HELMUT. Über die um 2000 V.Chr. in Europa benutzten Kupferlegierungen. *Forschungen u. Fortsch.*, 24 (1948), pp. 153-156.

Historique des analyses durant le siècle dernier. Classification des alliages de cuivre utilisés dans la préhistoire d'après leur composition chimique. DG

448. OTTO, HELMUT et WITTER, WILHELM (and others). *Handbuch der ältesten vorgeschichtlichen Metallurgie in Mitteleuropa*. Leipzig, J. A. Barth, 1952. 222 pp., 30 illus., 33 pl., 5 cartes.

Examen chimique, dans le passé, d'alliages de cuivre préhistoriques; nouvelles voies d'investigation par analyse spectrale; valeur des preuves d'origine de la découverte du métal de la préhistoire; examen métal-



lographique; tableaux d'analyses (1300 échantillons); description des méthodes spectrographiques et discussion des résultats.

Reviewed in: *Conservation*, 1 (1952/53), p. 92, by Earle R. Caley.  
DG

449. PISEK, M. F. A Czech manuscript on the art of founding. *Tech. et civil.*, 2, no. 7 (1951), pp. 11-20; *J. Iron Steel Inst. (London)*, 168 (1951), p. 446.

A description is given of the contents of a remarkable sixteenth century document in Czech. It was written by Kircka and is concerned with the manufacture of guns, pumps, and bells.

450. PIWOWARSKY, E. Moulding and founding technique in the Pre-Christian era. *Giesserei*, 38 (1951), pp. 548-556; *J. Iron Steel Inst. (London)*, 170 (1952), p. 86.

This is a review of knowledge on the working of gold, copper, bronze, iron and cast iron by the people of the Near East, Egypt, and China. There are 41 illustrations of archeological subjects.

451. PLUMER, JAMES MARSHALL. The Chinese bronze mirror; two instruments in one. *Art Quart.*, 7 (1944) pp. 90-108, 19 figs.

The Chinese bronze mirror is not only an efficient reflector of light but is also a symbol of the Light Supernatural. In this review of mirrors, principally of pre-Han examples, the author describes various technical aspects including alloy used and casting and finishing techniques. An analysis of a typical late Chou mirror showed Cu 72.1, Sn 26.2, and Pb 1.4 percent (total 99.7 percent). In mirrors of the Han period, an increase in the amount of Pb—up to 5 percent—is sometimes noted. No evidence of mercury is found analytically in spite of numerous references to its use in Chinese literature. Some mirrors were cast by the "lost wax" process, but stone molds were also used (a photograph of a stone mirror mold is shown). In the finished mirror evidence of "gates" or points of entry of the molten metal seldom exist. Close examination reveals clear evidence of numerous methods of abrasion, tooling, and burnishing. In design the mirror was twofold; the obverse or polished reflecting side was functional and secular; the reverse bore ornament of symbolic religious meaning. There is not only symbolism of plan but symbolism of ornament. (The article is richly illustrated by photographs of details and by drawings.) RJG

452. POCKOCK, BRYANT W. The history of electroplating. *Products Finishing (Amer.)*, 7, no. 7 (1943), pp. 28-30, 32, 34; *C.A.*, 37 (1943), 3351.

Modern electroplating, a relatively recent development, has roots which are traced back to the time of the ancients.

453. POTTIER, R. The metal workers of the Sahara. Part I. With the Tuareg. *Metaux et Civil.*, 1 (1945), pp. 31-40; *J. Iron Steel Inst. (London)*, 157 (1947), p. 653.

The technique used by the craftsman of the Tuareg for the working of iron, silver, and copper is described.

454. QUIRING, HEINRICH. *Geschichte des Goldes; die goldenen Zeitalter in ihrer kulturellen und wirtschaftlichen Bedeutung*. Stuttgart, Ferdinand Enke Verlag, 1948. 318 pp. illus., tables (part cold.), map.

Contents: Kulturschwankungen und Goldzeiten; Bronzezeit (2100–1200); Eisenzeit (1200–50) und romanische Kaiserzeit (–50 bis +500); Mittelalter (500–1492); Neuzeit (seit 1493). BMU

455. QUIRING, HEINRICH. Das Gold im Altertum. *Forschungen u. Fortsch.*, 18 (1942), pp. 55–58; *Chem. Zentr.*, Pt. 1 (1942), p. 2741.

Historique de l'extraction et de l'utilisation de l'or en Afrique, en Asie Mineure, aux Indes et en Europe. L'auteur s'attache principalement à l'Egypte et passe en détail les périodes depuis la prédynastie. DG

456. RAY, PRIYADA RANJAN. Chemistry in ancient India. *J. Chem. Educ.*, 25 (1948), pp. 327–335.

Various metals and alloys were known in India as far back as the Indus Valley civilizations of 4000–3000 B.C., as revealed by excavations at Mohenjo-daro. Gold, silver, and electrum were used for jewelry. Copper was used for ornaments and utensils, and lead and tin were also known, although the latter was usually in the form of bronze in which the percentages of tin ranged from 6 to 13. Some of the copper objects contained nickel, one example being found in which the percentage of nickel was 9.38. An alloy of copper with 3 to 4.5 percent arsenic was also used at Mohenjo-daro in place of bronze.

Bricks, pottery, faience, and terra cotta have been found in abundance at Indus Valley sites. The most abundant ceramic objects are of brown glazed pottery. Some specimens of polychrome pottery have been found.

Brass, iron, and steel were in use in India before the beginning of the Christian Era. Brass vessels belonging to about the first century B.C. have been unearthed in excavations at ancient Buddhistic stupas, and brass coins were in common use at about the same time. Iron implements and weapons have been found in excavations of burial sites in the Madras Presidency under conditions that indicate a date prior to the fourth century B.C. Iron clamps of the Bodhi-Gaya temple and iron slag found in the excavation of the foundation of the stupa at the same place furnish definite evidence of iron manufacture as early as the third century B.C. The famous iron pillar at Delhi of about the fourth century A.D. and later large iron pillars show the high degree of skill in the working of iron. In the garden temple at Puri of about A.D. 1174 there are 239 iron beams ranging up to 17 feet in length and 6 inches by 6 inches in cross section. These consist of highly pure wrought iron as shown by the following analysis: Fe =

99.64 percent, P = 0.15 percent, C = trace, S = trace, Mn = none. True steel was made on a small scale by the crucible process, and was used, for example, in the manufacture of surgical instruments.

Many kinds of minerals and artificially prepared metal compounds were used as pigments and in medicinal preparations at various periods in ancient India. ERC

457. RICKARD, T. A. Homeric metallurgy. *Trans. Canad. Inst. Min. Metall.*, 52 (1949), pp. 58-63; *J. Iron Steel Inst. (London)*, 163 (1949), p. 366.

Quotations relating to metals, copper, and bronze in particular, from the Iliad are discussed. The Trojan war was in the early days of iron and Homer, in the Iliad, indicates that he is familiar with iron as a commodity and as a metal for making agricultural implements, including axes; it was evidently not produced in a quality sufficiently good for weapons of war.

458. RIEFSTAHL, ELIZABETH. Doll, queen or goddess (and) Appendix II: Examination of a bronze figurine (Egyptian), by R. J. Gettens. *Brooklyn Mus. J.*, (1943/44), pp. 7-23, plates.

A late Egyptian bronze figure of a nude girl is described and is compared with similar figurines in other collections. Technical examination showed that the metal was copper-tin alloy (bronze) with lead. Inlay material of the left eye is calcium carbonate (Egyptian alabaster). Inlay of the pubic triangle is glass set in a bedding of Egyptian blue frit. In the hollow rectangle and medallions of the crown are remains of colored inlay; blue is Egyptian blue frit and orange red is glass colored with cuprous oxide. A brown material in certain rectangles tests for lead and suggests that these formerly contained some kind of leaded glass or paste. Other hollows are filled with copper corrosion products, chalky earth remains, and fragments of charcoal. RJG

459. RIETH, A. *Die Eisentechnik der Hallstattzeit*. Leipzig, J. A. Barth-Verlag, 1942. 178 pp. 97 illus. (Mannus-Bücherei, Bd. 70.)

Contents: Preface; Introduction; The technique of forging; The technique; Annex; Analysis of Hallstatt iron objects; Examination by metallography; Literature; Chronology. P.C.

460. RIVET, PAUL, and ARSANDAUX, HENRI. *La métallurgie en Amérique précolombienne*. Paris, 1946. 254 pp., tables, chart. (Université de Paris. Travaux et mémoires de l'institut d'ethnologie, 39.)

Contents: Introduction; Métallurgie du cuivre; Métallurgie de l'or; Métallurgie de l'argent; Métallurgie du plomb; Métallurgie du platine; Métallurgie du fer; Métallurgie du zinc; Font et coulage; Placage; Soudure; Durcissement par martelage à froid; Revêtement métallique; Dorure sur bois; Rivetage; Assemblage par couture; Assemblage par bouton; Repoussé et estampage; Plaques à contours découpés ou ajourées; Conclusions générales; Bibliographie; Index des matières; Auteurs, collections, personnages, historiques et mythologiques. BMU

461. ROOT, WILLIAM C. Gold-copper alloys in ancient America. *J. Chem. Educ.*, 28 (1951), pp. 76-78; *C.A.*, 45 (1951), 5089i.

In pre-Columbian times Indians of Colombia and Panama invented an alloy of gold and copper called "tumbaga." This alloy was gilded by a process called *mise en couleur* in which the object was alternately treated with corrosive vegetable juices and heated. This process dissolved out Cu and enriched the Au at the surface. Only polishing was necessary to give the effect of solid Au. Application of Au leaf to surfaces was also practiced.

462. ROOT, WILLIAM C. Metallurgy. In *Handbook of South American Indians*, v. 5. *The comparative ethnology of South American Indians*. (Smithsonian Institution. Bur. of American ethnology, Bulletin 143), 1947, pp. 205-225, tables.

Contents: Sources of metal; Mining; Smelting; Working of metals; Hammering, embossing, and engraving; Casting; Annealing; Welding; Soldering; Bimetallic objects; Metal inlays; Gilding and coloring; Metallurgical regions; Historical development; Bibliography. BMU

463. ROOT, WILLIAM C. The metallurgy of the southern coast of Peru. *Amer. Antiq.*, 15 (1949), pp. 10-37, illus., tables.

Two hundred and seventy-two chemical analyses, mostly quantitative, are reported on a variety of gold, silver, copper, and alloy objects. Some observations are reported on the metalworking methods of hammering, embossing, engraving, annealing, casting, soldering, welding, and gilding. The development of metallurgy from the early Paracan period through the Inca period is traced. RJG

464. ROOT, WILLIAM C. A study of some copper objects from Guatemala. In Dutton, Bertha P., and Hobbs, Hulda R. *Excavations at Tajumulco, Guatemala*. Albuquerque, University of New Mexico press, 1943, pp. 115-116. (Monograph of School of American research, Santa Fe., N. Mex. no. 9.)

Spectroscopic analysis of objects, mostly bells, from Tajumulco showed they were made from very pure copper, sometimes containing a trace of silver. The most likely region from which the pure Tajumulco copper was obtained is Chiapas on the highland of Guatemala. Ninety-five copper objects from neighboring regions were also analyzed in the same manner, but they do not run so consistently of high purity copper as do the Tajumulco objects. More analyses will have to be made before the region of pure copper objects can be delimited. (Analytical results are given in two tables.) The bells and a filigree ring were cast by the *cire-perdue* process. There is no example known where filigree or wirework involved welding or soldering, and none of the objects showed any sign of gilding. RJG

465. ROSS, F. M. The iron industry of the Oberpfalz in the Middle Ages and early modern times. *Archiv Eisenhüttenw.*, 21 (1950), pp. 205-215; *J. Iron Steel Inst. (London)*, 168 (1952), p. 115.



The growth and flourishing period of the Iron Industry in this region are outlined. Ore, wood, and water formed the basis on which it was built, and their importance is discussed in connection with the various production methods (direct, blast furnace, sintering), and with the working-up into sheets. The production techniques, the social structure and organization of the mining and metallurgical industries of the Oberpfalz afford a completely new picture of a vanished major industry which in the later Middle Ages and early modern times was of great importance, both near and far.

466. SALIN, ÉDOUARD. *Le haut moyenâge en Lorraine d'après le mobilier funéraire; trois campagnes de fouilles et de laboratoire*. Paris, Paul Geuthner, 1939. 335 pp., illus., map. (Rhin et orient, v. 1.)

Contents: Preface; Introduction; Archaeological data on the sites and the excavated objects (IV to VIII cent.); Technique of excavation; Restoration of objects discovered; Application of laboratory methods to archaeology; Examination of the techniques of goldsmith's work; Index; Literature. PC

467. SALIN, ÉDOUARD. Sur les techniques de la métallurgie du fer de la préhistoire au temps des grandes invasions. *Rev. mét.*, 49 (1952), pp. 165-176, 12 illus.

Bref aperçu du traitement des fers au Musée de Nancy. Origine et empirisme de la métallurgie ancienne. Examen métallographique d'une épée de la Tène, de trois épées d'Alise (1er siècle v. Chr.), de fers gallo-romains, d'armes mérovingiennes, alamaniques et germaniques. La technique des tranchants, le martelage, la trempe, le durcissement de l'acier par l'azote, le damas oriental. Description de quelques casques, les courants d'influence. DG

468. SALIN, ÉDOUARD, et FRANCE-LANORD, ALBERT. *Le fer à l'époque mérovingienne*. Paris, P. Geuthner, 1943. 292 pp., 71 illus., 53 pl. (Rhin et orient, v. 2.)

Contents: Corrosion et procédés de conservation des fers; méthodes d'analyse, la structure et la composition; métallurgie et techniques artisanales; Le fer dans l'armement et dans la parure, La damasquinure sur fer: les plaques de ceintures et autres applications; Le fer dans l'équipement et dans la vie domestique. Restes organiques conservés par la rouille. Synthèse des faits nouveaux. Références bibliographiques. DG

469. SANDERSON, L. The history of British steel. *Brit. Steelmstr.*, 13 (1947), pp. 469-473; 521-525, 569-573, 614-618; 14 (1948), pp. 42-47, 86-91, 134-139, 180; *J. Iron Steel Inst. (London)*, 159 (1948), p. 462.

The history of the manufacture of iron and steel in Great Britain is traced from the Roman occupation up to the present time.

470. SCHAEFFER, CLAUDE F. A. La contribution de la Syrie ancienne à l'invention du bronze. *J. Egypt. Archaeol.*, 31 (1945), pp. 92-95.

Analyses of bronzes found at Byblos and Ras Shamra indicate the intentional alloying of tin and copper as early as the end of the third millenium B.C. The discovery of unfinished objects indicates that the bronze was of local manufacture. On the basis of seven original analyses the tin content of these ancient Syrian bronzes was found to average about 11 percent. Lead, iron, and zinc were present as the principal impurities. ERC

471. SCHUBERT, H. R. Anglo-Saxon cutlery. *J. Iron Steel Inst. (London)*, 157 (1947), pp. 22-26; *C.A.*, 41 (1947), 7349.

About A.D. 670 the manufacture of cutlery attained a very high standard in the kingdom of Northumbria. Twenty-six references.

472. SIMPSON, BRUCE L. *Development of the metal castings industry*. Chicago, American foundrymen's association, c1948. ix, 246 pp., pls., facsims.

Contents: Introduction; Prehistoric development of the metal; Far Eastern foundry development; Casting development in the Mediterranean Basin; Melting and molding methods of the Renaissance; Casting of bells and guns; Sand castings of direct blast-furnace iron; The early iron foundry; Colonial foundries in the New World; Metals and melting in the nineteenth century; Development of foundry mechanization; Recognition of source material; Illustration sources; Bibliography; Index. BMU

473. ŠIROKICH, J. Ancient furnaces for direct reduction of iron from ores of the Silurian Basin in central Bohemia. *Hutn. List.*, 3 (1948), pp. 270-273; *J. Iron Steel Inst. (London)*, 162 (1949), p. 373.

The discovery of remnants of ancient direct-reduction furnaces is described, and an explanation is given of the functioning and chemical processes in these furnaces which were operated at only 700-900° C. Ores containing 45-48 percent of iron and 10-30 percent of silica were broken up into 15-25 mm. pieces which were mixed with an equal volume of charcoal. This mixture was charged into the furnace in quantities of about 70 cu. dm. at a time. Such a charge yielded 2.5-5.8 kg. of iron, and 5-12 charges were necessary to obtain about 30 kg. of iron, for which a time of 12 to 24 hours was required. To withdraw the iron it was necessary to break open the lower part of the furnace wall, which was then repaired so that the operation could start afresh.

474. SMYTHE, J. A. Notes on ancient and Roman tin and its alloys with lead. *Trans. Newcomen Soc.*, 18 (1937/38), pp. 255-265; *J. Inst. Metals, Metallurgical Abstr.*, 7 (1940), p. 465; Cf. *C.A.*, 35 (1941), 1017; *C.A.*, 36 (1942), 5755.

Four Cornish ingots and two other objects of unknown origin were examined and found to consist of Sn of the order of 99.9 percent purity. Examination of several hundred Roman objects, 17 of which are described here, revealed that no pure Sn was used, the Sn being alloyed with Pb in simple proportions by weight.

475. STREET, ARTHUR, and ALEXANDER, WILLIAM. *Metals in the service of man*. New and rev. ed. Harmondsworth and New York, Penguin books, Ltd., 1951. 237 pp., pls., diagrs. (Pelican books A125.)

Contents: Preface; "Dramatis personae"; Metals and civilization; How we get our metals; Making iron; Making aluminium; Alloys; Metals under the microscope; The inner structure of metals; The shaping of metals; The testing of metals; Corrosion; The metallurgy of iron and steel; The role of carbon in steel; Cast iron and alloy steels; Aluminium and its alloys; Magnesium and its alloys; Copper and its alloys; Four common metals; Some minor metals; The joining of metals; Powder metallurgy; Metals in war time; The future of metals; Glossary; Index.

Reviewed in: *Nature (London)*, 153 (1944), p. 634 under the title "Metallurgy in everyday terms," by S. W. Smith.      LB

476. SWARUP, D., and MISRA, R. C. Ancient copper industry of Almora district, U. P. *Quart. J. Geol. Mining Met. Soc. India*, 17 (1945), pp. 12-16; *C.A.*, 41 (1947), 3721.

Description of primitive smelting with charcoal. The slag analysis given contains 0.5 percent Cu and contains olivine in a glassy matrix. The metal produced contains 98.8 percent Cu and only traces of Pb, Fe, As, and Sb, but malleability and ductility are poor, probably because 2.5 percent  $\text{Cu}_2\text{O}$  is present.

477. TERNBACH, JOSEPH. The archaic Greek helmet in St. Louis. *Archaeology*, 5 (Mar. 1952), pp. 40-46, illus.

The sixth century B.C. bronze helmet found in fragments at the ancient Metapontum in South Italy is surmounted by a ram's head with large silver crest. The helmet and ram's head were hammered out of a single sheet of bronze, which must have been about 35 inches in diameter. There is no evidence of seams or soldering. Analysis of the alloy showed 84.42 percent copper and 14.88 percent tin. Details of the original construction of the helmet and of the methods and materials of reconstruction are given.      RJG

478. TROJER, F. Phase structure of a Roman iron-works slag. *Radex Rundschau* (1952), pp. 132-136; *C.A.*, 47 (1953), 1017f.

Examination of an ancient direct-process slag from Magdalensburg in Carinthia showed that it had the following approximate composition: wustite 25, fayalite 50, ferrite 1-5, glass 10-15 percent, small amounts of an unknown crystal phase and hercynite deposited in the wustite. Lumps of Fe that accompanied the slag consisted of eutectic

gray pig-iron containing the phases: graphite, secondary cementite, and pearlite. The output of metallic Fe by the bloomery-hearth process was computed at about 54 percent.

479. UHRNS, H. Some notes on a piece of iron found at Petterstorped, Northeast Scania. *Bl. Bergshendt. Örebro*, no. 4 (1949), pp. 302–305; *J. Iron Steel Inst. (London)*, 168 (1951), p. 445.

Analytical data of the above finding prove that it is derived from bog iron ore.

480. VISSER, HERMAN FLOURIS EDUARD. Some remarks on gold granulation work in China. *Artibus Asiae*, 15 (1952), pp. 125–128, illus.

Few know that granulation work in jewelry was done in China, perhaps going back to the early Han Dynasty. The technique seems to have been derived from the West. Several examples of Far Eastern granulation work are mentioned.

RJG

481. WAINWRIGHT, G. A. Early tin in the Aegean. *Antiquity*, 18 (1944), pp. 57–64.

Sources of tin, analysis of tin content of Therni bronzes.

IG

482. WAINWRIGHT, G. A. Egyptian bronze making. *Antiquity*, 17 (1943), pp. 96–98.

Discussion on the accidental and intended smelting of copper and tin.

IG

483. WAINWRIGHT, G. A. Egyptian bronze-making again. *Antiquity*, 18 (1944), pp. 100–102.

Evidence for smelting of copper and tin.

IG

484. WAINWRIGHT, G. A. Iron in the Napatan and the Meroitic Ages, *Sudan Notes & Rec.*, 26 (1945), pp. 5–36.

Nubia and Ethiopia have a plentiful supply of iron ore, and at one time there was also timber for making charcoal. No iron was used in Ethiopia in the eighth and seventh centuries B.C., but knowledge of metal iron was introduced by Asianic mercenaries in the sixth century. Before the middle of the first century B.C. at least one heap of scoriae from iron-smelting operations had accumulated at Meroë. At Meroë there is no sign that the iron industry lasted after A.D. 350. The making of iron arrowheads did not begin until the first century A.D.; then they increase rapidly until the third century, after which they cease. Lower down the Nile, however, in the royal tombs of Ballana and Qustul (about 300–600 A.D.) near the Second Cataract, iron objects, and even iron ingots, are abundant.

RJG

485. WALZEL, R. The 2000-year tradition of the Austrian iron and steel industry. *J. Iron Steel Inst. (London)*, 161 (1951), pp. 364–373.

The growth of the Austrian iron industry, which is based on two main sources of ore in Carinthia and Styria, is traced from early Roman times to the present day, particularly in regard to the development of



the modern coke blast furnace from early reduction furnaces. Mention is made of the finery fires of the Middle Ages, which were gradually superseded by the puddling process. The effect of the invention of the Bessemer process was comparatively small, and this process declined and disappeared when the open-hearth process was invented. The electric-furnace process is also of great importance.

The main Austrian steel works are given, and the development of steel-fabrication and other associated industries with the economic development of the Austrian iron and steel industry is discussed. The growth of the Austrian tradition of quality and craftsmanship is mentioned, and examples are given of some of the works of art produced in the last two centuries. RMO

486. WEIERSHAUSEN, P. *Vorgeschichtliche Eisenhütten Deutschlands*. Leipzig, Curt Kabitzsch-Verlag, 1939. 235 pp. 70 illus. (Mannus-Bucherei, Bd. 65.)

Contents: Introduction; W. Germany; S. Germany; E. Germany; C. Germany; N. Germany; Ostmark, Böhmen and Mähren, France, Belgium, Switzerland; Ventilation; Bronze, rough iron, steel and soft wrought iron; Iron bars; "Taleae ferreae"; Ores exploited; Summary on the discovery of metal; Analyses of slag; Analyses of iron; Literature; Index. PC

487. WITTER, WILHELM. Metal investigation (copper and bronze) in the service of archaeology. *Nova Acta Leopoldina*, 12 (1943), pp. 197-214; *Chem. Zentr.*, Pt. 1 (1943), p. 2274; *C.A.*, 38 (1944), 4537.

Supported by comprehensive metal investigations (spectrum analyses) of museum specimens which originated in the earliest periods of European metal ages, and investigations of actual metal deposits in place, the author follows the development of metallurgy of Cu and Cu-Sn alloys, and assigns the different metal groups (pure Cu, crude Cu, Cu containing Ag, tetrahedrite metals, Cu containing Sn, Cu containing As, Cu-Sn alloys, and Cu-As alloys) to the ore occurrences in central Germany.

488. WITTER, WILHELM. Neues zu den Barrenring-Hortfunden im Vorlande der Ostalpen. *P.Z.*, Bd. 34, 5 (1949-1950), pp. 179-190, 1 illus., 3 tabl.

Le dosage spectrographique quantitatif des impuretés caractéristiques est réalisé sur nonante anneaux en cuivre provenant de la région des Alpes Salzbourgeoises. Les teneurs sont comparées à celles de restes de fonderies trouvés dans la même région. L'auteur en déduit que certains cuivres ont été découverts en leur lieu d'origine tandis que d'autres ont été importés. DG

489. WITTER, WILHELM. Wie ich zum Erforscher vorgeschichtlicher Metallgewinnung wurde. *Jabress. Mitteldtsch. Vorgesch.*, Bd. 33 (1949).

Recherches de la provenance de nombreux objets préhistoriques en cuivre (2500 av. Chr.) par analyses comparatives avec les restes de fonderies d'Allemagne centrale. Classification suivant la composition chimique des alliages et leur teneur en impuretés. DG

490. ZIETZ, JOSEPH R., JR. "The Pirotechnia of Vannuccio Biringuccio." *J. Chem. Educ.*, 29 (1952), pp. 507-510.

A general discussion of the treatise on metallurgy which was first published in 1540 and which later appeared in several editions and translations. ("The Pirotechnia," tr. from the Italian . . . by Cyril S. Smith and Martha T. Gnudi. New York, American institute of mining and metallurgical engineers, 1942). The life of the author and background of his information are outlined. The influence of this work on the late more scholarly work, "De re metallica" by Georgius Agricola (1556), is discussed. Main contents of the work are summarized. RJG

## 2. EXAMINATION AND TREATMENT

491. BLACK, GEORGE, and SINNER, JACK. Identification of plated coatings. *Metal Finish.*, 41 (1947), pp. 529-530; *C.A.*, 41 (1947), 649*i*.

A combination of physical and chemical tests is applied for identification of various electroplated metals. For colored deposits, clean the surface and add an alkaline cleaner. If the deposit dissolves, it is Cd or Zn. If insoluble add a drop of  $\text{HNO}_3$ . If insoluble the deposit is Au. If it dissolves, spot-test with HCl. A negligible reaction indicates Cu, slow attack brass, or bronze. Brass can be distinguished by qualitative tests for Zn or Sn. For white deposits, clean the surface and treat with  $\text{HNO}_3$ . If inert, treat with NaOH. If the deposit dissolves it is Al. If inert to NaOH treat with HCl. If inert the deposit is Pt. If it dissolves, it is Cr. If the deposit dissolves in the original treatment with  $\text{HNO}_3$ , spot-test with dilute HCl. If inert the plate is Ag or Pb. If it dissolves slowly the deposit is Ni. If it dissolves readily it is Cd, Sn, or Zn. Sn can be identified by adding solid cacotheline to the HCl solution. A reddish violet color appears if Sn is present. Cd can be distinguished from Zn by dissolving in  $\text{HNO}_3$ , making alkaline, and adding 10 percent  $\text{Na}_2\text{S}$ . A white precipitate indicates Zn, a yellow precipitate indicates Cd. Pb can be distinguished from Ag by testing with  $\text{K}_2\text{CrO}_4$ . Pb will give a bright-yellow precipitate.

492. BRAIDWOOD, ROBERT J., BURKE, JOSEPH E., and NACHTRIEB, NORMAN. H. Ancient Syrian copper and bronzes. *J. Chem. Educ.*, 28 (1951), pp. 87-96; *C.A.*, 45 (1951), 5090*a*.

Chemical analyses were made on 20 out of 140 specimens recovered in sites in the Amouq in northwest Syria. Extensive chemical and

metallographic studies were also carried out. Results are reported in 15 tables. In phase F (about 3500-3100 B.C.) Cu tools made their first appearance. In these Ni and As are chief impurities. These elements originated as impurities in the Cu ores. In phase G (about 3100-2800 B.C.) a fairly elaborate metal industry flourished. Copper was hot-worked or annealed. There is good evidence that ore reduction was practiced. Deliberate alloying with Sn was done to produce bronze which was used only for making castings. From the study of several figurines it is believed they were cast by the lost wax process. This Syrian site is within the "fertile crescent" of the Near East where it is held by many that the smelting of metals had its origin.      RJG

493. BORRELLI, LICIA. Il restauro della vittoria di Brescia. *Boll. ist. centrale restauro*, 1 (1950), pp. 29-35, 5 illus.

Restauration d'ordre esthétique, nettoyage et consolidation d'une statue en bronze d'époque romaine.      DG

494. BRIGHT, WILLARD M. The treatment of iron antiquities. *M.J.*, 46 (Apr. 1946), pp. 1-5, illus.; *Museum*, 55-56 (1946), pp. 51-53. Extract of the article in French.

A special method and equipment were developed at the Peabody Museum, Harvard University, for the treatment of over 500 iron artifacts from the Illyrian culture of northwestern Yugoslavia. This was based on reduction of iron rust by illuminating gas (chiefly hydrogen and carbon monoxide) at a temperature of 600°-700° C. in an electrically heated furnace made from 3½ inch diameter-39 inch length of seamless iron tubing. Complete details of furnace construction (with wiring diagram) and operating procedure are given. Time of reduction was three to four hours. Following furnace treatment the iron powder and other residues from the rust layer were removed with a scratch brush. The objects thus treated acquired a black metallic lustre owing, probably, to the formation of iron carbide. A final protective coating of vinyl acetate lacquer or of wax-resin mixture was applied. The method has advantage over electrolytic and alkali-zinc reductions methods in that no final washing is necessary and a superior finish is obtained. The author believes the method is safe even in the hands of nonchemists.      RJG

495. CAGIANO DE AZEVEDO, MICHELANGELO. Restauri a porte di bronzo. *Boll. ist. centrale restauro*, 9-10 (1952), pp. 23-40, 17 illus.

Trois importantes restaurations de portes d'églises en bronze du 11<sup>e</sup> 12<sup>e</sup> et du siècle sont exécutées à l'Istituto Centrale del Restauro. Sont décrits: l'historique, les traitements, les problèmes de remontage, les reconstitutions par fragments coulés à cire perdue.      DG

496. CALEY, EARLE R. Chemical examination of an ancient sheet of metal of unique composition found in Greece. *Ohio J. Sci.*, 52 (1952), pp. 161-164.

A flattened sheet of metal with a repoussé design in Greek style, which apparently had once been the side of a cylindrical vessel, was

found in the bed of the Alpheus River in Greece and was first thought to be a bronze or copper object because it was covered with a grayish-green patina. However, attempts to clean it revealed that the surface of the bare metal had the appearance of silver. Further examination showed that the sheet was constructed of a layer of a reddish metal sandwiched between two layers of a white metal. Analysis showed that the reddish metal was essentially pure copper and that the white metal was composed of about one-half copper, one-third tin, and one-sixth lead. No other example of the use of an alloy of this composition in either ancient or modern times could be located. This object apparently had been made by hammering the repoussé design in a sheet of copper, dipping this into the molten white alloy, and finishing the surface of the heavily coated copper by tooling and polishing. The date of this object is uncertain, but it may have been Roman. ERC

497. CALEY, EARLE R. Chemical investigation of two ancient bronze statuettes found in Greece. *Ohio J. Sci.*, 51 (1951), pp. 6-12; *C.A.*, 45 (1951), 4628g.

A female statuette (I) and an animal statuette (II) were examined chemically and microscopically. No. I had a coarse, dendritic structure with the normal appearance of an ordinary cast Sn bronze. In the second there were a great number of globular and irregular particles of metallic Pb, indicating the presence of a high proportion of unalloyed Pb. The metal surrounding the Pb had a dendritic structure. In both statuettes the structure of the matrix indicated they had both been produced solely by casting. The first was found to be an ordinary bronze of the following composition: Cu 92.28, Sn 7.00, Pb 0.13, Fe 0.16, Ni 0.05 and Zn 0.22 percent. The second was found to be an alloy of low Sn and very high Pb content with the following composition: Cu 60.40, Sn 3.74, Pb 34.56, Ag 0.22, Fe 0.33, Ni 0.09, and Zn 0.40 percent.

498. CALEY, EARLE R. Estimation of composition of ancient metal objects. *Anal. Chem.*, 24 (1952), pp. 676-681.

The validity and ability of specific-gravity measurements as a means of estimating the composition of all kinds of ancient metal objects are critically discussed with numerous examples. It is useful for rapidly distinguishing objects composed of precious metals from those composed entirely of base metals. For estimating Au in an object it is reliable and sufficiently accurate when the proportion of Au is high but increasingly less so as the proportion of Au becomes lower. It is good for estimating Ag in Ag objects only when the Ag content is high. Specific-gravity measurements appear to be of no value for estimating the quantitative composition of ancient objects made of base metals or their alloys. Corrosion vitiates any estimate of composition based on sp. gr. measurements. RJG

499. CALEY, EARL R. Validity of the specific gravity method for the determination of the fineness of gold objects. *Ohio J. Sci.*, 49 (1949), pp. 73-82.



The determination of the gold content of gold objects by means of specific-gravity measurements is one of the oldest methods of assay. The chief advantage of the method is that it makes possible an estimate of the fineness of gold objects which, because of their antiquity or artistic value, cannot be sampled in any way. From study of tables in which specific gravities and differences between the gold content from specific gravity and actual gold content are compared, it appears there is no justification for expressing the specific gravity of the pure metals to more than a single decimal place for the purpose of computing the composition of their alloys. On the average, therefore, a little more than 1 percent is the closest approach that can possibly be attained in respect to the composition of gold-silver and gold-copper alloys by this method. The method is only reliable for objects of high gold content and it becomes increasingly less reliable as the gold content decreases and it becomes very unreliable for objects of low gold content. There is no point in attempting to determine the specific gravity to more than the first decimal place nor is there any point in expressing the results to more than the nearest whole number in percent.

The uniformly very high gold content of the coins in the long series of Roman Imperial coins from Augustus to Diocletian extending over a period of three centuries is remarkable. It must be concluded that the Romans knew and applied a highly efficient process for the purification of native gold. RJG

500. CHICARRO DE DIOS, CONCEPCIÓN FERNANDEZ. Ensayo de curación de algunos bronce y hierros del Museo arqueológico de Sevilla. *Mem. mus. arqueol. prov. (Madrid)*, 9 (1948) extractos, pp. 119-130.

Références bibliographiques sur les phénomènes de corrosion et le traitements chimiques des objets de fouille. Méthodes utilisées dans les musées provinciaux d'Espagne. Liste de vingt-trois objets traités à Séville en s'inspirant des méthodes précitées. DG

501. CLABAUGH, W. S. A method for determining small amounts of gold and its use in ascertaining the thickness of electro-deposited gold coatings. *J. Res. Nat. Bur. Stand.*, 36 (1946), pp. 119-127.

Samples of definite area taken with punch and die. Solutions containing up to 10 micrograms in 25 milliliters were determined by o-tolidine. RLF

502. COGLAN, H. H. The value of analyses and metallographic study of metal artifacts, with a report on the examination of a Danubian artifact by E. Voce. *M. J.*, 48 (Jly. 1948), pp. 79-81. IG

503. COREMANS, PAUL B. De overblijfselen van het Sinte Geertruida schrijn te Nijvel; chemisch en metallografisch onderzoek. *Mededeel. Koninkl. Vlaam. Acad. Wetenschap. Belg.*, jaarg. 4, nr. 3 (1952), 18 pls., 10 pls.

Analyses chimique et spectrographique d'une châsse (Nivelles, 13° s.) en argent doré, incendiée en mai 1940. Diagrammes d'équilibre Cu-Ag.

Oxydation de ces alliages à basse et haute température. Examen métallographique de fragments. Le phénomène de démixtion. Phénomène de surchauffe et perte de malléabilité. DG

504. DE LAET, S. J. Analyse spectro-chimique de vases en métal de la nécropole de Samson. *Namurcum (Belgique)*, (1952), pp. 20–22.

Analyse spectrochimique quantitative d'une marmite en bronze et d'un bassin perlé en laiton du 5<sup>e</sup> siècle. L'auteur communique les méthodes des analystes et les résultats obtenus. De nombreux bassins perlés ayant été retrouvés dans la région de Namur, il souhaite pouvoir déterminer par des analyses comparatives si ces objets proviennent d'un même atelier localisé dans cette région. DG

505. DOORSELAER, M. VAN. Quantitative spectrochemical analysis of ancient bronzes. *Verhandel. Koninkl. Vlaam. Acad. Wetenschap. Belg. Kl. Wetenschap.*, 12, no. 35 (1950), pp. 3–27; *C.A.*, 45 (1951), 2367a.

Dissolve 4 milligrams of sample in  $\text{HNO}_3\text{-HCl}$ , allow the solution to be absorbed in a pure gray graphite electrode at 80°, and evaporate to dryness. For Cu, Sn, and Pb obtain the condensed-spark spectrum of a solution containing 1 percent of bronze and 2 percent of added Cu and compare the intensities of the line pairs Sn 2429.5/Cu 2441.6 and Pb 2833.07/Cu 2882.9. From the results, by means of standard curves, the content of all three metals can be determined with a precision of approximately 3 percent. For the minor and trace elements, obtain the Pfeilsticker interrupted-arc spectrum of a 3 percent solution of the bronze and compare the intensities of the lines Ni 3050.8/Cu 3073.8, Fe 2488.15/Cu 2400.1, Zn 3345.6/Cu 3349.3, As 2349.8/Cu 2400.1, Sb 2877.9/Cu 2882.9, Co 2407.26/Cu 2400.0, Au 2428.0/Cu 2400.1, Bi 3067.73/Cu 3073.80, Ag 3382.9/Cu 3349.26. Other line pairs are recommended for special situations. For these elements the precision is approximately 10 percent. Analyses of various bronze artifacts are included. The methods are also applicable to a variety of technical Cu alloys.

506. DUNHAM, DOWS. Two pieces of furniture from the Egyptian Sudan. *B.M.F.A.*, 46 (1948), pp. 98–101.

Two objects from the Museum's excavations in the Sudan, found in apparently hopelessly damaged condition were restored by William J. Young. One, a bronze libation stand, was found in three main parts, crushed and broken. The moderately thin sheet bronze was, from the nature of the alloy and the effects of time, extremely brittle. It was restored to its original form by repeated shaping and annealing, with some patching. The second object was a folding stool of completely decayed ebony, the various bars of which had been sheathed at intervals with alternating bands of bronze and silver with terminals of bronze ram's heads. The metal fittings were reassembled on a modern wooden framework. EHJ

507. EECKHOUT, J. Chemische analyses van een bronzen bijl. *Rev. belge arch. et hist. art*, 16 (1946), pp. 101-108, 1 illus.

Description complète d'une méthode d'analyse mixte par voie chimique et par spectrographie à l'arc. Application sur une hachette de la quatrième période de l'âge du bronze. DG

508. EVANS, B. S., and HIGGS, D. G. Spot tests for the detection of alloying elements in tin-base alloys. *Analyst*, 72 (1947), pp. 439-443; *C.A.*, 42 (1948), 483b.

The tests for Pb, Cu, and As are made on the surface of the cleaned sample. The test for Pb is the only one that is new for spot testing. The tests for Sb, Zn, and Al require the removal of the test drops at some stage. To *detect Pb* add drops of concentrated  $\text{HNO}_3$  and when the reaction is over, add water and a little solid urea. Then stir with a few drops of 4 percent KI solution and look for yellow  $\text{PbI}_2$ . To *detect Cu*, treat with  $\text{HNO}_3$ , make the solution ammoniacal and test with  $\alpha$ -benzoin monoxime,  $\text{NH}_4\text{OH}$ , and citric acid. To *detect As*, treat with 6N HCl saturated with  $\text{Br}_2$  and apply the Gutzeit test under suitable conditions. To *detect Sb*, treat successively with  $\text{HNO}_3$  and HCl. To the solution add a little solid  $\text{KNO}_2$  and spot with a 0.01 percent aqueous solution of tetraethylrhodamine. To *detect Zn*, treat with concentrated  $\text{HNO}_3$ , add urea to the solution, and a few drops of ammoniacal solution of  $\text{NH}_4\text{OAc}$  and 10 percent  $\text{K}_3\text{Co}(\text{CN})_6$  solution. Stir, test with a 1.5 percent solution of diphenylcarbazone in EtOH, and wash with  $\text{Me}_2\text{O}$  and with iso-PrOH. To *test for Al*, treat with 2 drops of concentrated HCl which is saturated with  $\text{Br}_2$ , and when excess Br is gone, add four to five drops of 20 percent NaOH solution which has been mixed with three volumes of 10 percent KCN solution. Treat close-grained filter paper with a 0.1 percent solution of Aluminon in EtOH, dry with hot air, place over a beaker and add the solution to be tested dropwise. Place the paper on clean porcelain and cover with filter paper wetted with a solution obtained by mixing 20 percent  $\text{NH}_4\text{Cl}$  solution with an equal volume of 10 percent  $(\text{NH}_4)_2\text{HPO}_4$ . Press down well, return the original paper to the beaker, and after 5 minutes wash twice with a 20 percent  $\text{NH}_4\text{Cl}$  solution and finally dry. Look for a sharp, pinkish crimson, irregular ring.

509. FINK, COLIN G. The electrochemical restoration of badly corroded silver-copper alloy objects. *Science*, 109 (1949), p. 597.

After long burial in the soil objects originally composed of alloys of silver and copper often have the appearance of corroded copper or bronze. On attempting to restore them electrolytically the silver is found beneath the surface layer of reduced copper. In the corrosion of such objects the silver is not attacked until all the copper has been oxidized. ERC

510. FRANCE-LANORD, ALBERT. La conservation du casque mérovingien de Baldenheim. *Cahiers arch. hist. Alsace (Strasbourg)*, n° 130 (1949), pp. 277-280, 2 illus.

La restauration d'un casque en bronze et fer orné d'argent et de cuivre doré. La réalisation d'un procédé de conservation en vitrine étanche dans une atmosphère d'azote. DG

511. GETTENS, RUTHERFORD JOHN. Corrosion products of an ancient Chinese bronze. *J. Chem. Educ.*, 28 (1951), pp. 67-71; *C.A.*, 45 (1951), 5090c.

The corrosion products on a Chou period bronze vessel containing about 21 percent Sn and 4.5 percent Pb occur in unusually well defined layered structures. From the interior the order is: unattacked metal core; residual dendritic metal structure in which a mixture of cupric and stannic oxides have replaced the eutectic part of the duplex cast structure, CuCl; redeposited Cu; Cu<sub>2</sub>O and SnO<sub>2</sub> mixture; mixture of basic chloride and carbonate of Cu. A series of chemical step reactions is proposed to explain the complex corrosion process.

512. GILLES, I. W. Analysen hallstattzeitlicher Eisenobjekte. *Mannusbücherei (Leipzig)*, Bd. 70 (1942), pp. 146-172, 6 illus.

Examen et coupes d'armes en fer de Hallstatt: analyse, interprétation, examens métallographiques. DG

513. GRAMME, L. et WEILL, ADRIENNE R. Examen de clous provenant d'épaves sous-marines de l'époque gréco-romaine. *Rev. mét.*, 49 (1952), pp. 524-530, 9 illus.

Examen de deux clous en cuivre: recherche des éléments par spectrographie, recherche des phases en présence par diffraction de rayons X. DG

514. HIDNERT, PETER. Thermal expansion of some bronzes, *J. Res. Nat. Bur. Stand.*, 30 (1943), pp. 75-88.

Values of  $16.2$  to  $19.9 \times 10^{-6}$  per degree C. obtained for various types of bronze: copper-tin, copper-tin-zinc, copper-tin-lead, copper-tin-lead-zinc, copper-aluminum, and copper-silicon. RLF

515. HOW, G. E. P. Electro-plating antique silver; should it be permissible? *Connoisseur*, 124 (1949), p. 112.

Old silver is sometimes electroplated to increase the weight and to hide repairs and alterations. The author shows how the action of heat causes the plating to blister and peel off. It is considered that this practice, for purposes of restoration, should be declared illegal. SRJ

516. HOW, G. E. P. Repairs and restorations of English silver. *Antiques*, 53 (Feb. 1948), pp. 137-139.

This condensation of an article in Notes on Antique Silver, no. 5, by Commander G. E. P. How discusses the regulations of changes and



repairs of English silver by the authorities at Goldsmiths' Hall, London. It points out pitfalls for the collector in the detection of repaired or falsified pieces and discusses methods and disadvantages of legitimate methods of repair.      EHJ

517. JACK, J. F. S. The cleaning and preservation of bronze statues. *M. J.*, 50 (1951), pp. 231-236.

A coating mixture consisting of 40 percent lanoline, 7 percent paraffin wax, and 53 percent white spirit is recommended for new statues to be exposed outdoors in urban atmospheres. Directions are given for periodic cleaning of a bronze statue and also for treatment of a neglected statue before lanoline treatment.      RJG

518. LEVY, J. F. A bronze object found in Punchaumarca. *Actas y trabajos Congr. peruano quim.*, 1 (1943), pp. 310-311; *C.A.*, 39 (1945), 4311.

Analysis of a hatchet-shaped, bronze object from the Inca period gave Cu 88.84, Sn 7.85, P 1.10, As 0.68, Zn 0.64, Sb 0.24, S 0.12, Fe 0.08, Si 0.001 percent, Au a trace, and no Pb or Bi. P, As, Zn, and Sb were probably introduced as impurities during the manufacture of the alloy.

519. LIBERTI, SALVATORE. Analisi e restauro di bolle papali in piombo in stato di avanzata corrosione. *Boll. ist. centrale restauro*, 7-8 (1951), pp. 37-42, 2 pl.

Des sceaux en alliage plomb-étain provenant des archives vaticanes ont été enfermés dans des coffrets en chêne imprégnés d'huile de lin. Ils sont en état avancé de corrosion. L'auteur décrit ses méthodes d'analyse (microscopie et analyse chimique), il constate la présence de carbonate de plomb avec traces de nitrate et substances organiques acides. Il développe les hypothèses des causes de corrosion et conclut à l'altération par l'huile de lin. La restauration consiste en lavages et en une imprégnation de vernis vinylique.      DG

520. LIBERTI, SALVATORE. Il restauro di alcuni specchi etruschi. *Boll. ist. centrale restauro*, 2 (1950), pp. 49-53, 2 pl.

Décapage de miroirs étrusques en bronze argenté par l'acide chlorhydrique 25 percent. Récupération de l'argent contenu dans la patine et redéposition de celui-ci sur l'objet.      DG

521. MARYON, HERBERT. The Bawsey torc. *Ant. J.*, 24 (1944), pp. 149-162.

An excellent detailed description of the method of construction and an analysis of the gold and silver content of the metal.      IG

522. MAYANTS, A. D. Sorting of bronzes and brasses by drop reactions. *Zavodskaya Lab.*, 12 (1946), pp. 666-672; *C.A.*, 41 (1947), 4081<sup>4</sup>.

The testing is done partly directly on the metal surface, partly on filter paper in a crucible or test tube where the drop is transferred after reacting with the sample. Concentrated  $\text{HNO}_3$  forms a dark spot with a white precipitate of  $\text{H}_{10}\text{Sn}_5\text{O}_{15}$  (after 1–2 min.) on all high-Sn bronzes and brasses. The Sn bronzes can be further sorted into under and over 4 percent Sn by the density of the precipitate formed. Sn-free alloys give a bright spot without precipitate. They are further differentiated either by  $(\text{NH}_4)_2\text{S}_2\text{O}_8 + \text{NH}_3$  which gives (in 10–15 minutes) a blue-shot black spot on brasses (except Si brasses), none on bronze, or in the presence of KF, with  $\text{K}_2[\text{Hg}(\text{CNS})_4]$ , resulting (in 1–2 minutes) in a green spot Cu  $[\text{Hg}(\text{CNS})_4]$  on bronze, dark violet on all brasses (complex CNS salts of Zn, Cu, and Hg). The latter reaction is carried out on filter paper onto which a drop of  $\text{HNO}_3$  that has reacted with the metal is deposited. In the high-Sn group, the P bronzes are identified by "selective blackening," depositing a drop of  $\text{HNO}_3$  (1:1) on the metal for 1–2 minutes, washing off, and drying with filter paper; the dark spots are evidently  $\text{CuO}$ . The remaining Sn bronzes are tested for Pb on a drop of  $\text{HNO}_3$  (1:8) that has reacted with the metal, with 1 drop of 10 percent KI and 1 ml.  $\text{H}_2\text{O}$ . A gradually vanishing weak yellowish turbidity signifies a low-Pb bronze; a perceptible quantity of a bright yellow precipitate is formed with high-Pb bronzes in 5–6 minutes. Brasses are tested for Si by precipitation of  $\text{SiO}_2$  by a drop of concentrated  $\text{HCl} + \text{HNO}_3$  (1:1) (10 minutes), then for Pb directly on the metal; the Pb brasses are tested for Mn by  $\text{Ag}^+ + \text{S}_2\text{O}_8^{2-}$  resulting in segregation of Pb and Pb-Mn brass. The remaining material is tested for Al in a drop of concentrated  $\text{HNO}_3$  transferred from the metal to a crucible containing 2 drops of  $\text{K}_4\text{Fe}(\text{CN})_6$ ; add two drops of concentrated  $\text{Na}_2\text{SO}_3$  and one drop of  $\text{HCl}$  (1:1), mix thoroughly, transfer to a strip of filter paper; the black spot formed should remain colorless on treating with  $\text{NH}_3$  vapors, a blue color indicating presence of Cu which interferes with the test. Moistening with saturated alcohol alizarin solution gives a violet color changing to pink on heating or with 10 percent  $\text{AcOH}$  in the presence of Al to yellow in its absence. The test permits detection of 0.5 percent Al in 5–10 minutes; it is necessary to run a blank with the paper. Alloys with a positive reaction for Mn are tested for Ni: moisten the metal with a drop of a solution containing  $\text{H}_2\text{SO}_4$  10 ml.,  $\text{HNO}_3$  10 ml.,  $\text{H}_3\text{PO}_4$  10 ml., citric acid 10 g., and water 25 ml., let stand for 1 minute, remove the drop with a dry strip of filter paper saturated with citric acid 10 g., water 25 ml., and 1 percent alcohol dimethylglyoxime solution 10 ml., and moisten the spot obtained with  $\text{KOH}$  or  $\text{NH}_4\text{OH}$ ; presence of Ni is indicated by a bright-red spot in not over 3 minutes. Sn-free bronzes are first segregated by their color into Al bronzes (including Si brass) (yellow) and other (reddish); in the first group, Si brasses are eliminated by tests for Si. The Al bronzes are tested successively for Pb, Mn, and Ni. The remaining material is tested successively for Pb, Mn, and Si. Complete schemes of qualitative separation are given. The percentage of erroneous results was 1 percent.

523. Nederlandse. Centraal instituut voor materiaalonderzoek. Reiniging en conservering van opgegraven ouse ijzeren voorwerpen [Rapport] *Bull. Ned. Oud. Bond.*, 6th ser., 1 (1948), pp. 23-31.

Refers to the cleaning and the impregnating of old iron objects still having a metallic core. Results (obtained by the different methods) normally used in museums are given. Several industrial products (Rodine 603, I pri 17 and I pro 93) of which the composition is not indicated, were used. PC

524. OLSON, GILLIS, and THORDEMAN, BENGT. Cleaning of silver objects. *M. J.*, 50 (1951), pp. 250-252; *C.A.*, 45 (1951), 4976a.

Silver sulfide tarnish is reduced by immersing in  $\text{Na}_2\text{CO}_3$  solution in contact with Zn or Al (except for niello-decorated objects.) After successive washings in distilled water the object is dried at 50°-60° C. While still warm, objects are dipped in acrylate lacquer. Various questions as to the extent of cleaning are discussed. RJG

525. ORGAN, R. M. Ion-exchange resin in the treatment of (ancient) lead objects. *M. J.*, 53 (1952/53), pp. 49-52.

The basic carbonate that is formed on an old lead object can be removed with satisfactory results if the object is placed in a glass vessel and packed with a suitable resin (like Amberlite 1R-120) in distilled water and kept at 60°-90° C. for several hours. Prolonged treatment attacks the Pb. Without washing the object is dried, brightened with a glass brush, and then coated by dipping in molten paraffin. RJG

526. OTTO, HELMUT. Die chemische Zusammensetzung einiger Hortfunde aus der halleischen Gegend. *Jahress. Mitt. Vorges.*, 34 (1950), pp. 90-100.

Analyses are tabulated for 32 out of 68 objects (Cu and Cu alloys) analyzed, mainly rings, spirals, daggers, and celts of the early Bronze Age in Europe. The alloy compositions may be grouped in two main classes: *A* as copper with 4-8 As; *B1* nickel-free gray bronze with Ag to 1.5, As to 3 percent and Sb to 2 percent; *B2*, nickel-containing gray bronze with Ag averaging 1.5, Ni 1.5 percent, As 1 percent, Sb 1-5 percent, and varying amounts of Sn up to 13 percent. An attempt is made to relate metal composition to local early Cu ore sources. RJG

527. PIGGOTT, S., and PIGGOTT, C. M. Excavations of barrows on Crichel and Lancelton Downs, Dorset. *Archaeologia*, 90 (1944), pp. 47-80.

In Appendices I and II (pp. 77-78), Desch shows by spectrographic analysis that a metal awl is composed of bronze, and Stoner shows that a bead is composed of calcite. ERC

528. ROSSI, FILIPPO. The Baptistry doors. *Burl. Mag.*, 89 (1947), p. 334. (Trans. from *Il Ponte*, Florence, April 1947).

The article is mainly a study of the historical evidence that the doors were gilded. After removal to safety in 1943 the doors were closely examined. Analysis showed that "the layer of green beneath the successive varnishes was composed of calcareous matter obviously deriving from the dust of the street and . . . atmosphere." The cleaning, which revealed the original gilding, is not described. Eight photographic details. SRJ

529. SALIN, ÉDOUARD. Traitement au laboratoire des fers archéologiques. *Métaux et Civil.*, 1 (1945), pp. 49-61, 12 illus.

Procédés de décapage par voie sèche: au moyen de meules ou de jet de sable; par voie humide: par électrolyse. Méthodes de consolidation et de protection. Description, technique et traitement de plaques de ceintures damasquinées. DG

530. SECCHI, GIOVANNA. Analisi di bronzi, leghe di argento e leghe metalliche eseguite sulle porte di Trani e Montecassino. *Boll. ist. centrale restauro*, 9-10 (1952), pp. 41-47.

Analyses gravimétriques de bronzes et d'alliages d'argent sur des échantillons prélevés à des portes d'église du 11e et du 12e siècle. Méthodes et résultats. DG

531. SNEYERS, R. Rapport sur l'examen et le traitement de quelques objets provenant de la nécropole de Lommel-Kattenbosch. *Antiquité class.*, 19 (1950), pp. 364-366.

Concernant sept objets d'époque Hallstatt. DG

532. TERNBACH, JOSEPH. Restoration of ancient bronzes. *Museum News*, Mar. 1, 1949, pp. 7-8, illus.

The manual or mechanical method for cleaning ancient bronzes is advocated. This is done with small chisels and hammer and other hand tools. Advantage is taken of a natural tendency for the outer green copper minerals to cleave from the inner and more compact cuprite layer when struck with properly applied force. The restorer must be able to control the tools so securely that no tool mark is evident on the surface of the object. After removal of incrustations the object is given a bath in hot distilled water, and then patches of corrosion are tested for active disease and repeatedly washed and dried until the powdery substance has disappeared. RJG

533. VAN DER HOOP, A. N. J. T. Enkele opmerkingen over het conserveren van ijzeren voorwerpen in het Museum te Batavia. *Bull. Kon. Ned. Oud. Bond*, 3 (1950), pp. 62-64.

L'extraction des chlorures est pratiquée sur des objets en fer provenant d'une fouille à Wanasari. L'auteur mentionne la méthode de réduction au zinc et à la soude; l'imprégnation par la paraffine, le traitement "Marangi" pour les kriss javanais et une méthode de conservation des fers par mélange benzine-vaseline. DG



534. VOGEL, HERMINE. The cleaning of metal objects of antiquity, museum pieces, and bronze monuments. *MetallOberfläche*, 1 (1947), pp. 107-111; *Chem. Zentr.*, Pt. 1 (1947), p. 951; *C.A.*, 43 (1949), 3335.

Directions are given for cleaning objects of Au, Ag, bronze, Cu, brass, tombac, Pb, and Sn partly by chemical solution and partly by reduction with nascent H.

535. WATERMAN, D. M. Excavations at Dundrum Castle, 1950. *Ulster J. Ant.*, 14 (1951), pp. 15-29.

Appendix on p. 27 gives a technical report on a small bronze roundel, by E. M. Jope, with a spectrographic analysis. IG

536. WEILL, ADRIENNE R. Analyse aux rayons X de deux plaques d'or provenant de fouilles archéologiques. *Metallurgia ital.*, n° 12 (décembre 1951), pp. 3-7, 12 illus.

Par diffraction de rayons X et par mesure de densité des objets, il a été possible de déterminer approximativement la composition et quelques détails de fabrication de deux plaques en or d'époque romaine provenant des fouilles de Kertsch. DG

537. WEILL, ADRIENNE R. Étude aux rayons X de l'hétérogénéité des précipitations dans un alliage or-argent-cuivre. Analyse d'un objet égyptien antique en électrum. *Conservation*, 1 (1952), pp. 30-38, 9 illus.

La composition approximative de l'alliage d'un bijou en électrum est déterminée par mesures physiques de la densité et par diffraction de rayons X. Deux phases cristallines sont en présence. Il semble ne pas y avoir eu d'évolution vers un équilibre au cours des 4,000 ans d'âge, l'alliage présente toujours une forte hétérogénéité due à sa nature et au façonnage de l'objet. DG

538. WEILL, ADRIENNE R. Étude aux rayons X d'objets égyptiens et romains à base d'or. *Rev. de mét.*, 49 (1952), pp. 293-298, 11 illus.

La composition, l'hétérogénéité, les traitements thermiques et mécaniques de deux alliages d'or-argent-cuivre sont interprétés par les mesures de densité et du paramètre de la maille cristalline au moyen des rayons X. DG

539. WILSHAW, C. T. Identification of metals and alloys by chemical spot testing. *Metallurgia*, 45 (1952), pp. 102-106; *C.A.*, 46 (1952), 4953b.

Detailed directions are given for determining Ni, Cr, and Mo in metals and alloys.

540. YEVONDE & BROOMFIELD. *Filmstrip on the restoration of metals*. Black and white. 27 frames. London, 1952. Distribution: Education Productions, Ltd.

The filmstrip illustrates the cleaning and treatment of archaeological metal objects. RJG

541. YOUNG, WILLIAM J. Technical examination of Greek helmets. *B.M.F.A.*, 48, no. 274 (1950), pp. 83-86, illus.

A recently acquired sixth century Corinthian helmet was studied metallographically. Although deeply corroded, it has a typical annealed wrought structure which also shows signs of cold working. Spectrographic comparison was made with specimens from five other early Greek helmets. (Results are shown in tabular form.) In addition to copper and tin all specimens contain impurities which are characteristic of ancient metals. Lead varies from medium to trace; zinc and arsenic are present only in traces or is absent. Nickel is low or absent in all. RJG

### 3. CORROSION

542. BEVAN, D. G. Atmospheric corrosion of metals and building materials. *Surveyor*, 106 (1947), pp. 235-236; *C.A.*, 42 (1948), 5401*b*.

Except in coastal areas, dissolved  $\text{CO}_2$  is the destructive agent in fresh air. City atmosphere carries  $\text{SO}_2$  and tar acids. Bituminous paints give reasonable protection on clean metals, but are not satisfactory for repainting old work. A mixture of equal parts red and white lead is preferred for repainting. Galvanized ware has a short life at the seaside. Exfoliation is the most common form of attack on building stones. It may be due to crystallization of soluble salts beneath the surface skin, or to differential thermal expansion between the dense skin and the porous interior. Decay is hastened by using different kinds of stone in juxtaposition, e.g., limestone against sandstone. Similarly, repointing old porous masonry with dense mortar accelerates weathering.

543. BINAGHI, R. Corrosion par discontinuité superficielle des alliages de métaux ferreux; expériences. *Métaux et corrosion*, 25 (1949), pp. 216-222, 3 illus.

L'influence de la pureté du fer sur son inaltérabilité. Quelques exemples de conservation de fers antiques. DG

544. COREMANS, PAUL B. Alteratie van de zilveren relikwieënkast der H. Geertruida. *Handelingen van het 6e Congres voor algemene kunstgeschiedenis*. Gent, F. Vyncke, 1942. pp. 91-93.

Les phénomènes d'oxydation à basse et haute température. Application à un alliage argent-cuivre d'une châsse du 13<sup>e</sup> siècle incendiée à Nivelles en 1940. DG

545. COREMANS, PAUL B. Les bronzes anciens chinois et leurs patines. *Inst. Belge études chinoises*, 8 (1947), pp. 102-105.

Les impuretés, la structure, la patine des bronzes anciens et en particulier de provenance chinoise; notions brèves des critères d'authenticité. DG

546. DENISON, IRVING A., and ROMANOFF, MELVIN. Soil-corrosion studies, 1946 and 1948: Copper alloys, lead and zinc. *J. Res. Nat. Bur. Stand.*, 44 (1950), pp. 259-275. Ferrous metals and alloys. *ibid.*, pp. 47-49.

Corrosion of copper, lead, zinc, iron, steel, and certain alloys in various type soils discussed. RLF

547. EVANS, ULICK RICHARDSON. *An introduction to metallic corrosion*. London, Edward Arnold & co., 1947. 210 pp.

Contents: Preface; Historical note; Electrochemical introduction; Film growth; Electrochemical corrosion; Corrosion by acids and alkalis; Influence by environment; Effect of stress, strain and structure; Prevention of corrosion by soluble inhibitors; Prevention of corrosion by protective coverings; Statistical and mathematical treatment; List of abbreviations; List of references; Index.

Reviewed in: *Nature (London)*, 162 (1948), p. 316 by J. C. Hudson. RMO

548. EVANS, ULICK RICHARDSON. *Metallic corrosion; passivity and protection*. 2d ed. London, Edward Arnold & co., 1946. 863 pp.

Contents: Introduction; Simple examples of corrosion and passivity; Study of thin films; Oxidation at high temperatures; Corrosion in moist or polluted atmospheres; Corrosion not involving the absorption of oxygen; Corrosion of ferrous materials involving the absorption of oxygen; Corrosion of non-ferrous materials involving the absorption of oxygen; Influence of stress, strain and structure; Influence of contacts and crevices; Protection by inhibitive treatment of water; Protection by chemical and electrochemical treatment; Protection by paints and enamels; Protection by metallic coatings; Testing; Appendix; Author index; Subject index. BMU

549. FINK, COLIN G. Metal articles found in the tomb of Tut-Ankh-Amen. *J. Electrochem. Soc.*, 94 (1948), 16 N.; *C.A.*, 43 (1949), 451.

Absolute dryness is not essential for counteracting corrosion. Furthermore, some moisture in the surrounding air seems necessary to preserve wooden articles over long periods of time.

550. FRONDEL, CLIFFORD. On paratacamite and some related copper chlorides. *Mineralog. Mag.*, 29 (1950), pp. 34-45.

Paratacamite is identical in chemical composition with atacamite,  $\text{Cu}_2(\text{OH})_3\text{Cl}$ , but is a rhombohedral species dimorphous with atacamite. The crystals of a natural mineral specimen from Remolino,

Chili, are uniaxial positive without perceptible dichroism. Indices of refraction are  $\omega$  1.843,  $\epsilon$  1.849. Although the dimorphous substance atacamite is orthorhombic, the two substances are probably closely related structurally since the position and relative intensity of their stronger lines in their X-ray powder patterns are nearly identical. Paratacamite is formed as a corrosion product when brass or copper sheets are sprayed with sea water at a temperature of 85°F. It is quickly formed when cuprous chloride or the mineral nantokite is exposed to a moist atmosphere. Both paratacamite and atacamite were identified as constituents of the green patina and alteration crusts present on various copper and bronze objects from Egypt and the Near East in the collection of the Fogg Museum at Harvard. Other related basic copper chlorides are described; among these is botallackite,  $\text{Cu}_4(\text{OH})_6\text{Cl}_2\cdot 3\text{H}_2\text{O}$ , which was also observed on an Egyptian bronze. RJG

551. GETTENS, RUTHERFORD J. Tin-oxide patina of ancient high-tin bronze. *B.F.M.A.*, 11 (1949), pp. 16–26.

The hard patina of ancient Chinese mirrors was shown by X-ray diffraction analysis to consist mainly of  $\text{SnO}_2$ . RJG

552. GILBERT, P. T. Corrosion of copper, lead, and lead-alloy specimens after burial in a number of soils for periods up to 10 years. *J. Inst. Metals, Metallurgical Abstr.*, 73 (1946), pp. 139–174; *C.A.*, 41 (1947), 678.

Specimens of Cu, Pb, and Pb alloys containing small amounts of Sb and Cd or Te, buried in seven types of soils for periods up to 10 years, showed marked differences in the corrosiveness of the soils. The most corrosive soil, moist acid clay, caused approximately 50 times as much loss in weight as the least corrosive soil, chalk, and resulted in penetration of one 1/2 inch bore 4 lb./yard pipe in less than 5 years. It was not possible to correlate the corrosiveness of a soil in a simple way with one or more features of the soil analysis; however, sulfate-reducing bacteria are believed to play an important part in the action taking place in the more corrosive soils. The differences in behavior of different materials was much less marked than the differences between the soils. In the two most corrosive soils, moist acid clay and wet acid peat, it would be unwise to bury unprotected pipes of any of the materials. Complete data are given in tables and curves.

553. NEWELL, A. D. Corrosion inhibition. *Amer. Rifleman*, 100 (July 1952), pp. 39–41, illus.

Describes tests on VPI 260 (dicyclohexylammonium nitrite) as a rust preventative for gun barrels. Both VPI powder and VPI impregnated paper gave good results. Protection is offered so long as the iron surface is bathed in VPI vapors. RJG



554. PALMAER, EVA. Recherches sur la composition variable des couches épaisses de rouille. *Métaux et corrosion*, 25 (1949), pp. 23-28, 1 illus.

Méthodes et résultats comparatifs d'analyses d'échantillons de rouille prélevés à diverses profondeurs: épée Viking, boulet, canon, pièces modernes. Méthode particulière pour la détermination simultanée d'oxydes ferreux et ferrique et de fer métallique en atmosphère d'argon. DG

555. Prevention of corrosion by vapour-phase inhibitors. *Nature (London)*, 164 (1949), p. 215.

A note on the use of wrapping materials impregnated with a substance "Shell V.P.I. 260" (Shell Chemicals Ltd.) to prevent corrosion of steel, cast-iron, aluminium, duralumin, and chromium plated objects. RMO

556. Shell oil company, New York. *VPI; a volatile corrosion inhibitor—confidential report L-9*. New York, The author, 1951. [27] l. incl. Appendices.

A brochure which describes properties and applications of a group of organic nitrite salts now used widely for protection of iron against rusting. RJG

557. TESTI, GINO. Corrosione di metalli da parte di insetti. *Boll. ist. patologia libro*, 7 (1948), pp. 40-45.

Dégâts observés sur du plomb et sur du zinc et, en particulier, sur des cartouches, des clichés typographiques, des étuis, des fils aériens. Identification des insectes et moyens de défense. DG

## G. COINS AND COINAGE

558. BALOG, PAUL. Aperçus sur la technique du monnayage Musulman au Moyen-âge. *Bull. Inst. Egypt*, 31 (1948/49), pp. 95-105, 3 pls.

The Mohammedans introduced the process of casting into coinage. Blanks were usually cast as small slugs in a string of beads or in clusters. In some countries blanks of better quality were cut from plaques hammered from ingots. The direct method of making stamps was to cut them directly in metals. This slower method was superseded in Mohammedan times by stamps made from a matrix in which was cast an impression from a direct-cut stamp. In certain countries copper coins of small denominations were cast, not struck. RJG

559. CALEY, EARLE R. The earliest use of nickel alloys in coinage. *Numismatic Rev.*, 1, no. 1 (1943), pp. 17-19.

Attention is called to the chemical analyses by Flight, made some 85 years ago, of certain copper-nickel coins of Bactria. No other ancient coins, as far as is known, were composed of an alloy of nickel. Though certain tokens, such as those issued by Feuchtwanger, and many pattern coins, particularly of the United States mint, were struck in alloys of nickel before the middle of the nineteenth century, regularly authorized governmental issues of coins composed of such alloys were not issued in modern times until after the middle of the nineteenth century. ERC

560. CALEY, EARLE R. Fineness of the gold coins of the Roman Empire. *Numismatist*, 63, no. 2 (1950), pp. 66-70.

In contrast to the serious debasement of their silver coins, the gold coins of the Romans were maintained at a high standard of fineness throughout the Imperial Period. Although this is commonly recognized as true, very little specific information has been published. Specific gravity measurements afford a reliable means of estimating the gold content of coins of very high fineness without damaging them. The technique of measurement is described and a table for converting specific gravity to fineness is included. Results of such determinations of the fineness of 45 representative coins ranging from the time of Augustus to that of Julius Nepos are given. The average, and almost constant, high fineness of 990 of the coins from Augustus to Diocletian, inclusive, is remarkable. ERC

561. CALEY, EARLE R. Methods of distinguishing cast from struck coins. *Numismatic Rev.*, 2, no. 4 (1945), pp. 21-24.

Two different problems are discussed. One is the problem of determining whether coins of a given type were cast or struck. For the solution of this, there is usually available a representative coin that may be destroyed for the purpose of obtaining the answer. The other is the problem of determining whether an individual coin was cast or struck, and for this only nondestructive methods are usually applicable.

The first problem is best solved by means of a metallographic examination of the metal of the representative coin. An outline of the procedure is given. The solution of the second problem is less certain, but it may usually be solved by an inspection of the coin, a determination of its weight, specific gravity, or hardness, by an X-ray examination, or by some combination of these methods. ERC

562. CALEY, EARLE R. Notes on the chemical composition of Parthian coins with special reference to the drachms of Orodes I. *Ohio J. Sci.*, 50 (1950), pp. 107-120; *C.A.*, 44 (1950), 7597.

Fourteen Ag coins were analyzed to determine Ag, Au, Cu, Sn, Pb, Fe, Ni, and Zn. The specific gravities of the coins were also determined. Six bronze coins were analyzed for the amounts of Cu, Sn, Pb, Fe, Ni, and As.

563. CALEY, EARLE R. On the occurrence of abnormally low weight and specific gravity in ancient coins. *Numismatic Rev.*, 3, no. 2 (1946), pp. 51-53.

Two coins of normal size, but of abnormally low weight and specific gravity, were investigated. One was an Alexandrian tetradrachm of Vespasian that weighed 7.16 grams and had a specific gravity of only 5.80. The normal weight of coins of this type is about 13 grams and their specific gravity, as calculated from their silver content, should be about 9.25. The other coin was a tetradrachm of Ptolemy XIII that weighed 7.98 grams and had a specific gravity of only 5.66, both of which are far below the figures for normal coins of the same type. The metal of both coins was found to have a spongy structure that accounted for their abnormal weights and specific gravities. It was concluded that these coins were originally of full weight and normal specific gravity, but that extensive intergranular corrosion occurred during long burial in the ground and that the corrosion products were subsequently leached out, probably on cleaning, thus leaving behind metal of spongy structure. In view of these observations, the weights of ancient silver coins of low fineness, which were originally much corroded and subsequently cleaned, should be used with caution in any studies of the ranges in weight of such coins or in calculating the average weight of coins of a given type.      ERC

564. CALEY, EARLE R. Restauración electrolítica de monedas antiguas de cobre y bronce. *Ciencias e invest. (Buenos Aires)*, 6 (1950), pp. 100-105, illus.

Complete description of the electrolytic process for the restoration of old copper and bronze coins.      RJG

565. CALEY, EARLE R. The specific gravity and fineness of Persian darics. *Numismatic Rev.*, 2, no. 1 (1944), pp. 21-23.

Data obtained by Head, Hunkin, and the author on the weight, specific gravity, and fineness of 10 specimens are tabulated and compared. The very high fineness of these coins and the small ranges of variation in their weight and composition are remarkable. This confirms the statement of Herodotus that Darius refined gold to the highest state of purity in order to have coins struck from it.      ERC

566. COLBERT DE BEAULIEU, J.-B. La trouvaille de Saint-Jacques-de-la-Lande, nouvelles constatations. *Rev. belge numismatique*, 97 (1951), pp. 105-116, 2 illus., 1 pl.

Description de monnaies en alliage cuivre-argent du 1er siècle av. Chr. L'importance du nettoyage pour la détermination du poids en numismatique.      DG

567. HUDSON, DOUGLAS RENNIE. Coinage metals in antiquity. Parts I-V: I. Punjab and Egypt. *Metallurgia*, 30 (Oct. 1944), pp. 313-320, illus.; *C.A.*, 39 (1945), 3768.

The historical development of Au, Ag, bronze, and electrum artifacts is reviewed. The fine workmanship in pre-dynastic Egypt before 3400 B.C. is illustrated. II. Iran and Irak. *Metallurgia*, 31 (Nov. 1944), pp. 23-30, illus. (part col.) The craftsmanship in Au, electrum, bronze, and Ag are reviewed. III. Asia Minor, Phoenicia and South Russia. *Metallurgia*, 31 (Feb. 1945), pp. 201-206; (Mar. 1945), pp. 249-252, illus., map of trade route. A critical review of metal extraction and craftsmanship since the 3d millennium B.C. IV. Mediterranean Littoral: East. *Metallurgia*, 32 (Sept. 1945), pp. 229-236; *C. A.*, 40 (1946), 1363. A critical historical review of process metallurgy in the rich Cu and bronze Mediterranean culture, and of accomplished Aegean craftsmanship in Au working, under the heads Sinai, Cyprus, Crete. V. Aegean and offshoot cultures: Cloisonné. *Metallurgia*, 32 (Oct. 1945), pp. 273-280; (Nov. 1945), pp. 33-40, illus., facsimis. Enamel work in Aegean and derivative cultures is described and illustrated. Etruscan metallurgy, Etruscan Sn, and bronze making are described.

568. MILES, GEORGE C. Minting technique. In his *The coinage of the Umayyads of Spain*. New York, 1950, pp. 96-101. (American numismatic series. Monograph no. 1.)

All coins were struck with dies. There was no systematic relationship between the position of obverse and reverse. Muling is indiscriminate; there are many cases of the interchange of dies; that is, of the employment of several reverse dies with the same obverse, or *vice versa*. Obverse and reverse dies were always carefully paired. The number of dies must have been enormous. Punches were used in constructing the die. RJG

569. NASTER, PAUL. La trouvaille d'Antoniniani de Grotenberge et le monnayage de Postume. *Rev. belge numismatique*, 97 (1951), pp. 25-88, 9 illus., 1 pl.

Méthodes de nettoyage pour monnaies en alliage cuivre-argent; plus de 2400 monnaies du 3e siècle découvertes en lot sont traitées. Calculs de la perte de poids d'après les méthodes utilisées. Composition et structure de cinq pièces. Etude numismatique. DG

570. NEWMAN, W. A. C. Monnaie britannique et alliages monétaires. *Endeavour*, 7 (1948), pp. 15-20, 4 illus.

Histoire de la monnaie; qualités requises des alliages monétaires. Les phénomènes de liquation et de ségrégation sur les alliages cuivre-argent autres que l'eutectique, leur influence sur le titre. Les opérations de monnayage. DG

571. PARAMASIVAN, S. Metallography of Indo-Greek bronze coins from Taxita. *Current Sci.*, 2 (1942), pp. 190-192; *Brit. Abs.* (B.I.), 1942, p. 480.

Variation in crystal grain-size and absence of deformation, indicated by photomicrographs of 120 coins, support Balmis's theory re-



garding ancient minting processes. An alternative explanation of the results is suggested. RMO

572. THOMPSON, F. C. The technique of casting coins in ancient India. *Nature*, (London), 162 (1948), p. 266.

An article on a report by Prof. Birbal Sahni in *Memoirs of the Numismatic Society of India*, no. 1, Bombay, 1945, on a clay mold found at Rohtak near Delhi for casting a coin of the Yaudheya series dated about 100 B.C. RMO

## H. PAPER, PAPYRUS, DOCUMENTS, AND BOOKS

### 1. HISTORY AND FABRICATION

573. ALLEY, HAROLD R. Japanese handmade paper industry. *Paper Ind.*, 33 (1951), pp. 932-933; *C.A.*, 46 (1952), 737g.

Very brief well-illustrated descriptive article dealing with establishments in the Ogawa region.

574. American paper and pulp association. *The dictionary of paper including pulps, boards, paper properties and related papermaking terms*. 2d ed. New York, 1951. 393 pp.

Contents: Preface; Acknowledgments; Philosophy of definitions; Classification and definitions of pulps; Classification of waste materials used in the paper and board industries; Definitions of papers, boards, and papermaking terms; Bibliography. BMU

575. BLUM, ANDRÉ SOLOMON. *On the origin of paper*. Trans. from the French by H. M. Lydenberg. New York, R. R. Bowker co., 1943.

Contents: Preface; I. Influence of paper on the spread of printing and engraving; II. Definition of paper, its invention in China, and its manufacture in the Orient; III. Paper making in Europe: the oldest mills; IV. Origin of Western paper: Spain; V. Paper in Italy, France, Germany; VI. Causes of slow growth of the paper industry; VII. Watermarks and means of dating paper; Conclusion; Notes; Index. BMU

576. ČERNÝ, JAROSLAV. *Paper & books in ancient Egypt*. . . . An inaugural lecture delivered at University College, London, 29 May 1947. London, H. K. Lewis & co. Ltd., 1952. 36 pp. with references.

BMU

577. FILLIOZAT, JEAN. Manuscripts on birch bark (*bhurjapatra*) and their preservation. *Indian Archives*, 1 (1947), pp. 102-108.

Birch bark has for long ages been used as the material for books in Northwestern India and Central Asia. There are still preserved letters on birch bark from North America dating from the seventeenth century. The Buddhist manuscripts of the tenth century date or earlier, discovered in Bamiyan in 1930 and in Gilgit in 1931, are mostly on birch bark mixed with a lesser number of palm leaves and paper. Bark manuscripts which come from dry regions are best preserved, but those which have been subjected to damp have suffered. The bark is not softened by water, but often the sheets stick together and become extremely fragile. The layers cleave and fall to powder when unrolled or handled. Flat pieces may be preserved between glass or transparent plastic panels. In a process developed at the Bibliothèque National in Paris crumpled masses of bark manuscript from Bamiyan that were glued together with dried mud were softened and separated by immersion in warmed paraffin oil. The dried mud split up easily and allowed the bark fragments to be drawn out. Each piece was drained and laid on a sheet of glass. Each fragment was covered with a piece of glass smaller than that which carried it and the edges were sealed with paraffin.

RJG

578. HAGEN, VICTOR WOLFGANG VON. *The Aztec and Maya papermakers*. New York, J. J. Augustin, 1944. 120 pp. 39 pls.

Contents: Introduction by Dard Hunter; Foreword; Paper and civilization; The paper tribute; The twilight of the gods; Pietro Martire and the "American books"; Paper from the inner bark of trees; A good paper is made from metl; The paper clue of the Sumus; The Otomi papermakers; The fibers of the amatl; The geography of paper tribute; The paper-world of the Aztecs; Epilogue; The American fig tree, by Paul C. Standley; Appendix; Notes; Bibliography; Index; Illustrations.

Reviewed in: *Isis*, 35 (1944), pp. 13-15 under title "Ancient American papermaking," by Philip A. Means.

——— Limited de luxe edition. New York, J. J. Augustin, 1943. 113 pp., col. front., plates (part mount., part col.), fold. maps.

——— Spanish edition. 1945.

BMU

579. HEAWOOD, EDWARD. *Historical review of watermarks*. Amsterdam, 1950. 37 pp., illus.

Reprinted from: *Dictionary & Encyclopedia of Paper and Papermaking*.

Contents: Watermark—definition—purpose—classification; Watermarks by period and region; Miscellaneous; Short bibliography.

BMU

580. HERDEG, WALTER, and RENKER, ARMIN. *Art in the watermark; Kunst im Wasserzeichnen; L'art du filigrane*. Zurich, Amstutz & Herdeg, 1952. 103 pp., illus.

Contents: Preface; Art in the watermark; Index; Illustrations.

BMU

581. HUNTER, DARD. Ohio's pioneer paper mills. *Antiques*, 49 (Jan. 1946), pp. 36-39, 66.

A brief account is given of the history and technique of papermaking. Paper used east of the Allegheny Mountains was often imported from Europe, but the excessive cost of transportation encouraged the local production of paper in the West during the early settlement period. The earliest paper manufactory west of the Alleghenies was set up in Georgetown, Ky., in 1791, the first in Ohio in 1807. The author discusses other early paper mills with illustrations of their watermarks.

EHJ

582. HUNTER, DARD. *Papermaking in Indo-China*. Chillicothe, Ohio, Mountain house press, 1947. 102 pp., 2 mounted samples. Limited edition of 250 copies.

Contents: Foreword; [The journey to the *Villages du papier*, Yèn-Thai and Lang-Buoi, the ancient villages of Tonkin, Indo-China]; The papermaking materials of Indo-China; Preparing the bark for papermaking; The lime treatment; The cooking process; Beating the bark for making it into paper; The material used in sizing the paper; The papermaking moulds of Indo-China; Forming the sheets of paper on the moulds; Papermaking by machine in Indo-China; Description of the photographs; Species of the *Daphne* tree.

BMU

583. HUNTER, DARD. *Papermaking; the history and technique of an ancient craft*. London, Pleiades books, c1947. 611 pp., xxxvii pls., illus., plans, map.

Contents: Before paper: the writing substances of the ancients; Ts'ai Lun and the invention of paper—the influence of calligraphy upon paper and the influence of paper upon printing; Empress Shōtoku and her million printed prayers—the first text printing upon paper to be executed in the world; The hand-mold, the papermakers' most essential tool, upon which rest the two thousand years of papermaking history; The maceration of materials for papermaking from the primitive mortar and pestle of ancient China to the improved Hollander of Europe; Early papermaking processes and methods; Paper, a sacred material—the use of paper in the Orient for ceremonies and purposes unknown in the Western world; The paper and the papermakers of Europe and America during the early years of printing; Ancient watermarks, six and a half centuries of mystic symbols; Latter-day watermarks, the nineteenth-century development of watermarks into an artistic and technical achievement; Papermaking materials—with the eighteenth-century development of printing, Occi-

dental papermakers were forced to begin their search for vegetable fibres never before used; The paper-machine and its inventor, Nicholas Louis Robert. The paper-machine revolutionizes printing; Printing revolutionizes papermaking, and the world-wide quest for new paper-making fibres begins in earnest; The watermarking of machine-made papers and the use of watermarks in detecting forgery; Present-day papermaking by hand in Europe; Handmade papers vs. machine-made papers. Paper made by the ancient traditional methods still has limited use, but the paper-machine has altered every phase of life; Chronology of papermaking, paper, and the use of paper; Bibliography; Notes; Index.

"The present book embraces a selection of material from the expensive editions, but is issued in modest price. This compilation is not a reprint of any previous volume, but it draws from many of them, with a store of material not previously used. . ." Foreword. BMU

584. KUNISAKI JIHEI 國東治兵衛. *Kamisuki chōbōki* 紙漉重寶記  
A handy guide to papermaking. After the Japanese edition of 1798 with a translation by Charles E. Hamilton. Berkeley, The Book arts club, University of California, 1948. 78 pp. illus.

Japanese text reproduced in its entirety. English and Japanese on opposite pages.

Contents: Translator's preface; Author's preface; The true paper mulberry; Cutting paper mulberry in winter; Selling paper mulberry; Steaming paper mulberry; Peeling the bark; Drying paper-mulberry bark; Marketing; Soaking the bark; Shaving off the thin bark; Removing astringency; Cooking the mulberry fiber; Second washing of the fiber; Varieties of the Tororo plant; The beating stick; Molding *hanshi* (I); Equipment; Molding *hanshi* (II); Drying the paper; Cutting *hanshi*; Making up *hanshi*; Baling; Packing out to the coast. BMU

585. LABARRE, E. J. *Dictionary and encyclopedia of paper and paper-making with equivalents of the technical terms in French, German, Dutch, Italian, Spanish & Swedish*. 2d ed., rev. and enl. Amsterdam, Swets & Zeitlinger, 1952. 488 pp. illus., tables.

Contents: Author's introduction with list of contributors and list of sources; Dictionary and encyclopaedia of paper and paper-making . . . containing encyclopaedic articles on: edges, felts, marble, philately, photographic papers, printings, sizes, standardization, wall-papers (illustrated), watermarks (illustrated), wrappings, writings; English index (of words and names other than catch-words) with separate indexes for French, German, Dutch, Italian, Spanish and Swedish. BMU

586. *Paper Trade Journal*. (Special number). The progress of paper with particular emphasis on the remarkable industrial development in the past 75 years and the part that *Paper Trade Journal* has been



privileged to share in that development. New York, The Lockwood trade journal company, inc., 1947. 391 pp., illus., map.

Gives the history of paper from papyrus to parchment to paper.

RJG

587. RANGANATHAN, S. R. *Social bibliography or physical bibliography for librarians*. Delhi, India, University of Delhi, 1952. 348 pp. (Library science series, no. 4).

Contents: . . . 6. Papermaking; 7. Printing and binding. BMU

588. REICHARDT, GUNTHER. The durability of paper. *Indian Archives*, 1 (1947), pp. 230-232. Abstracted from: *The Library Quarterly*, 8 (Oct. 1938).

A review of the findings of several research organizations. The most important rules for durability are: (1) Good raw materials and (2) fine technical processing of materials. RJG

589. TINDALE, THOMAS KEITH, & TINDALE, HARRIET RAMSEY. *The hand-made papers of Japan*. Tokyo, 1952. 4 vols., illus.

Contents: Vol. I. The hand-made papers of Japan; Bibliographical guide; Introduction by Dard Hunter; Complete history and descriptions of papermaking in Japan, supplemented with botanical drawings and a series of 32 full-page photographs of an ancient papermaking village by Francis Haar; The text includes a facsimile handcolored reproduction with translation of the oldest Japanese work on paper-making, "*Kamiksuki taigai*," compiled in 1784. II. The Seki collection: 187 actual mounted specimens ranging in date from the Nara period to the present day. III. The contemporary collection: A volume of whole-page samples of 139 different papers from 18 prefectures and the city of Kyōto. The name, materials, place of manufacture, and use of each paper are given. IV. The Watermark collection: A portfolio of 20 of the finest modern Japanese watermarks made in the mills of the government printing agency at Oji and Saidaiji. Samples contain elaborate land and seascapes, Noh drama masks, flowers, fruits, and other characteristic designs. BMU

## 2. EXAMINATION AND TREATMENT

590. ALMELA MELIÁ, JUAN. *Manual de reparación y conservación de libros, estampas y manuscritos*. Mexico, 1949. 124 pp. illus. fac-sims. (Instituto Panamericano de Geografía e Historia. Comisión de Historia. Publicación 10. Manuales de técnica de la investigación de la historia y ciencias afines, 2.)

Résumé dans: *Boll. ist. patologia libro*, 10 (1951), p. 179 par A. Gallo.

591. ARIAS, A. CHARRO. New method for restoring falsified or faded documents. *Farm. nueva (Madrid)*, 7 (1942), pp. 480-485; *Chem. Zentr.*, Pt. I (1943), p. 1916; *C.A.*, 38 (1944), 4065.

Moisten, blot, and cover with a few drops of 25 percent 8-hydroxy-quinoline in 6 percent HOAc, wash with water after a few minutes, and dry. Residual iron from ink is visible in daylight or ultraviolet light.

592. BACK, E. A. Bookworms. *Indian Archives*, 1 (1947), pp. 126-134, pls.

Reprinted by permission from: *Smithsonian Institution. Annual report*, 1938/39, pp. 365-374, 18 pls.

Aristotle, Horace, Ovid, and other classical writers mentioned the depredations of bookworms. Insects have destroyed more books and papers than fire and water. Ravages in warm and humid countries are much worse than in temperate zones. Book insects may be divided into three groups: (1) the true bookworms; (2) Surface feeding, i.e. cockroaches, silver fish and psocids, and (3) termites. There is great danger in shipping books from warm and humid climates to northern libraries. Control is best effected by storing in vermin-proof buildings with metal shelving, constant inspection, and periodic fumigation in vacuum vaults with ethylene oxide-carbon dioxide gas. RJG

593. BARKAS, WILFRED W. The optical analysis of glossy surfaces. *Pap. Makers' Assn. Gt. Brit. & Ireland*, 49th Gen. Conf., 5 (1945), 16 pp.

594. BARROW, WILLIAM J. *Procedures & equipment used in the Barrow method of restoring manuscripts and documents*. Richmond, Va., W. J. Barrow, 1952. 14 pp. fronts. Bibliography: pp. 13-14.

BMU

595. BARROW, WILLIAM J. Restoration methods [for paper]. *Amer. Archiv.*, 6 (1943), pp. 151-154.

Acid conditions which develop in old paper are the chief cause of deterioration. Decay may be arrested by immersing a document, first in 0.15 percent calcium hydroxide for 20 minutes and then in a solution of approximately 0.20 percent calcium bicarbonate. The precipitated calcium carbonate not only has a stabilizing effect upon the cellulose fiber but also acts as a buffer against the absorption of any acid at a later time. The neutralized paper may then be strengthened by lamination with cellulose acetate foil by first preheating between two electrically heated thermostatically controlled metal plates and then passing between two revolving calendar rolls which have a pressure range from 300 to 2,000 pounds per square inch. A complete cycle of heating and pressing requires about 35 seconds. RJG

596. BASU, PURNENDU. Enemies of records. *Indian Archives*, 4 (1940), pp. 7-13.

These are time, fire, water, light, heat, dust, humidity, atmospheric gases, fungi, vermin, "acts of God," and human beings. Brief note is made of their effects. Means for lessening or controlling are suggested.

RJG

597. BECKWITH, THEODORE D., SWANSON, W. H., and IAMS, THOMAS MARION. Deterioration of paper; the cause and effect of foxing. *Univ. Calif. Los Angeles. Publ. Biol. Sci.*, 1, no. 13 (1940), pp. 299-356, pls. 13-20.

Contents: Nonliving factors which bring about discoloration of paper; Fungi on paper; The iron content of paper; Iron and the growth of fungi in paper; Discoloration by pigment production; Sizing and filler with reference to growth of fungi on paper; Hydrogen-ion concentration of paper and fungous growth; Moisture and growth of fungi; Air conditioning in libraries; Histologic evidence of the presence of fungus in foxed paper; Digestion of cellulose by fungi; Fungicides with paper; Discussion; Summary; Literature cited; Explanation of plates.

BMU

598. BOLSÉE, J. La restauration des documents aux Archives Générales du Royaume. *Arch., bibl. musées belgique*, 21 (1950), pp. 3-10, 1 illus.

Description et fonctionnement du "Laminator Barrow."

RL

599. BONAVENTURA, GUSTAVO, et PAGANINI, M. L. *Epicoccum purpurascens* Ehrengberg isolato da cartone. *Boll. d'ist. patologia libro*, 4 (1942), pp. 1-10, 4 illus.

Description de l'altération chromatique sur carton moderne, dû à *E.p.* Description des caractères morphologique, de culture et physiologique. (D'après le résumé de G.B. et M.L.P.).

RL

600. BONAVENTURA, GUSTAVO. *Tenebroides mauritanicus*, L. insetto carticolo? *Boll. ist. patologia libro*, 6 (1947), pp. 65-71, 4 illus.

Cas de détérioration d'un livre moderne par *T.m.*, qui peut être considéré comme un agent d'attaque accidentel du papier.

RL

601. BUYN, K. E. C. Paper permanence. *Bull. assoc. tech. ind. pap.*, 5 (1951), pp. 231-238; *C.A.*, 45 (1951), 8768b.

After discussing the principal chemical components of the cellulosic fiber the author outlines the most satisfactory techniques in manufacture for insuring durability of paper. The fibers should be kept as nearly intact as possible, retaining "pure" cellulose. Refining should be kept at a minimum. Resins should have a positive polarity, only volatile organic acids being used, to obtain the required acidity in emulsions. In storage of paper (i.e., in archives) light (especially

ultraviolet light) and heat are to be avoided, and a relative humidity of about 55–60 percent is recommended (and in no case should the humidity drop below 40 percent). The deleterious effects of smoke, rodent, and insect attacks are mentioned.

602. CAMPOSANO, ANNA. *Rhodororula mucilaginoso* (Jørgensen) Harrison isolata da carta. *Boll. ist. patologia libro*, 5 (1946), pp. 106–112, p illus.

Caractéristiques de culture, biochimiques, et morphologiques; identification du *R.m.* RL

603. CAMPOSANO, ANNA. Su alcuni caratteri morfologici e fisiologici di *Pullularia (Dermatium) pullulans* (De Bary et Loew) Berkhout. *Boll. ist. patologia libro*, 7 (1948), pp. 46–75, 12 illus.

Après le résumé de la bibliographie, l'auteur donne l'étude morphologique et physiologique du *P.p.* et conclut que celui-ci ne constitue pas, à proprement parler, un fungus du papier. RL

604. CAMPOSANO, ANNA. *Zygosporium chartarum* nuovo micromicete carticolo. *Boll. ist. patologia libro*, 10 (1951), pp. 18–28, illus.

Mise en évidence sur un livre d'une nouvelle moisissure que l'auteur appelle *Z.c.* RL

605. CHAKRAVORTI, S. The effect of Gammexane on paper. *Indian Archives*, 2 (1948), pp. 54–58, chart.

Tests on rag paper and non-rag paper exposed to Gammexane (*gamma isomer of hexachlorocyclohexane*) smoke in doses of 2 oz. per 1000 cu. ft. show decided deleterious effect on tensile breaking strength and folding endurance. There is also slight decrease in the strength of dextrine-coated silk chiffon. Iron-gall ink fades slightly. These effects are caused by the acidic nature of Gammexane smoke. This powerful insecticide therefore is not recommended for disinfection of rare books and paper records but it could be used to fumigate empty stacks and storage spaces. Experimental details are given. RJG

606. CHAKRAVORTI, S. Effect of "Gammexane" on the durability of paper. *Nature (London)*, 163 (1949), p. 607.

A letter from the Research Laboratory, National Archives of India, stating that tests prove that treatment with the No. 2 "Gammexane" smoke generator is definitely injurious to paper records of all kinds. RMO

607. CHAKRAVORTI, S. A review of the lamination process. *Indian Archives*, 1 (1947), pp. 304–312.

The lamination process for preserving paper records, which was criticized by D. L. Evans in a paper "The lamination process—a British view," *Amer. Archivist*, 9 (Oct. 1947), is defended: (1) That it is undesirable because it is new is an unworthy argument; (2) that it has



not been tested by time is counter-balanced by reliable accelerated aging tests; (3) that the process is not reversible is not true; cellulose acetate lamination can be removed by simple immersion in acetone; (4) that lamination does not remove the cause of deterioration which may be inherent in paper or ink may be true but preservation is aided by lessening moisture absorption. RJG

608. CHAKRAVORTI, S., and MAJUMDAR, P. C. A note on "sulph-arsenic." *Indian Archives*, 1 (1947), pp. 114-117.

A sulpharsenical insecticide (made by mixing arsenious oxide with sodium sulphide in aqueous solution) which has been proposed as a book preservative, has been found to be injurious to paper. Accelerated aging tests show that immersion of paper in this solution lowers the tensile strength and bursting strength. Its use cannot be recommended. RJG

609. CHASTUKHIN, V. Zadachi nauchno-issledovatel'skoĭ raboty po gigiene knigi. (Tasks of scientific research work on book hygiene). *Bibliotekar'*, no. 9, (Dec. 1948), pp. 34-35; *Lib. Lit.* (1946-48), p. 55.

The writer enumerates various dangers threatening books of a physical and biological nature and discusses ways of controlling insect pests and fungi. He mentions specifically experiments of the Leningrad public library with high-voltage currents for drying and disinfection of books.

610. EVANS, D. L. The lamination process (for paper records), a British view. *Amer. Archiv.*, 9 (1946), pp. 320-322.

Excerpt from the author's views of Mrs. Alelaide Minogue's *The Repair and preservation of records*, reprinted from: *British Records Assoc. Tech. Sect., Bull.* no. 18 (Oct. 1945), pp. 10-14.

The advantages claimed for the cellulose acetate lamination process as used at the U. S. National Archives and advocated by W. J. Barrow of the Virginia State Library are questioned on the basis of: (1) It is doubtful the treatment can be undone if necessary; (2) the cellulose acetate is an untried material; (3) it does not cure acidity, the fundamental cause of brittleness. RJG

611. FLORENZANO, GINO. Studi sul genere *Chaetomium*, I. *Boll. ist. patologia libro*, 7 (1948), pp. 76-96, 6 pl.—II. *Ibid.*, 8 (1949), pp. 61-74, illus.

L'auteur définit la position systématique du genre et classe les 28 espèces en quatre sections. Puis il étudie la physiologie, surtout en rapport avec la propriété cellulolytique. Enfin il traite des détériorations du papier et des livres par les C. et des moyens de contrôle et de protection. RL

612. GALLO, ALFONSO. The pathology of books. *East and West*, 1 (1950), pp. 54-58, illus.

The director of the Istituto di Patologia del Libro in Rome reviews the gamut of afflictions to which books are subjected. RJG

613. GALLO, ALFONSO. *Patologia del libro*. *Boll. ist. patologia libro*, 8 (1949), pp. 1-55, illus.

L'auteur traite successivement de l'ambiance favorisant la conservation; des maladies du papyrus, des parchemins et peaux, du papier; des altérations biologiques, chimiques et des dommages par l'usage ou les accidents. Nombreuses références bibliographiques. RL

614. GALLO, ALFONSO. *Patologia e terapia del libro*. Roma, Raggio, 1951. 254 pp., illus. (Enciclopedia Poligrafica. Ser. I. Confezione dello stampato. Monografia I<sup>3</sup>.)

Dégradations et maladies, provoquées par organismes animaux et végétaux, des matières dont sont constitués les livres. Les papyrus, papiers, ficelles, toiles, parchemins, poils, colles animales, encres, fournitures métalliques sont diversement traités suivant les conditions d'utilisation. RL

615. GALLO, ALFONSO. Il restauro meccanico Barrow. *Boll. ist. patologia libro*, 10 (1951), pp. 119-126.

Description du procédé et discussion des avantages, avec 18 références. RL

616. GAYLORD BROS., INC. *Bookcraft; an illustrated manual describing the Gaylord unit method of book repair*. Syracuse, N. Y.; Stockton, Calif., 1947. 32 pp., illus. (Dealer's catalogue.)

Contents: Judging books; Removing and mending contents of books; Sewing contents of books  $\frac{1}{2}$  inch or less in thickness; Preparing and binding contents—Overcast method—Sewing clamp method; Preparing the case; Opening a new or repaired book; Description of equipment and essential supplies. BMU

617. HAJO, H. Decomposition of cellulose through molds and bacteria. *Mell. Textilber*, 23 (1942), p. 245; *Bull. Inst. Pap. Chem.*, 13 (1943), p. 223; *C.A.*, 37 (1943), 1597.

The development of molds and bacteria upon cellulose depends to a great extent upon the moisture content and the temperature of the surrounding air. At high relative humidities the growth of molds increases, the maximum being about 95 percent; bacteria show no further development at relative humidities above 86 percent. The active enzymes in the cleavage of the cellulose molecule are cellulase (which hydrolyzes it to cellobiose) and cellobiase (which changes cellobiose to glucose). The resistance of cellulose to attack by bacteria and molds depends upon its polymerization degree. Regenerated cellulose is more readily attacked than native fibers.

618. IAMS, THOMAS MARION. *Foxing and the deterioration of paper*. Unpublished M. A. thesis. Graduate Library School, University of Chicago, August, 1939. 97 pp.

619. ILLUMINATI, GABRIELLE. Metodo di determinazione degli insetti carticoli dalle erosioni prodotte. *Boll. ist. patologia libro*, 4 (1942), pp. 77-78, 9 illus.

Distinction entre Anobiidae, Dermestidae, Liposcelidae, Lepismidae et Calotermidae et Termitidae.      RL

620. ILLUMINATI, GABRIELLE. Ricerche sugli insetticidi. Diversi aspetti della lotta contro le infestazioni entomologiche nel materiale librario. *Boll. ist. patologia libro*, 5 (1946), pp. 65-70.

Discussion de quelques propriétés des insecticides, surtout D.D.T.; bibliographie: 10 références.      RL

621. ILLUMINATI, LUIGI. Introduzione allo studio della fauna carticola, alcune notizie sistematiche e biologiche di entomologia generale. *Boll. ist. patologia libro*, 4 (1942), pp. 25-33, 3 illus.

Liste systématique, avec brève description des attaques produites.

RL

622. JAFFAR, S. M. Protection of paper. *M. J. (Pakistan)*, 4 (Apr. 1952), *ICOM News*, 5 (Oct./Dec. 1952), p. 33.

Survey of the problems common to museums, libraries, and archives concerning the protection of paper documents and suitable remedies to prevent deterioration: cleaning and dusting, fumigation, insect repellents, flattening, glazing of documents to be exhibited, etc. . . . Facilities for practice training under expert supervision are provided by the Central Record Office N-W.F.P. (Pakistan).      RJG

623. JULLANDER, INGVAR. Treatment of paper with silicon esters. *Nature (London)*, 162 (1948), p. 300.

Describes the increase in wet strength and decrease of water permeability of papers by this means.      RMO

624. KIMBERLEY, ARTHUR E. Recent developments in record preservation. *Indian Archives*, 3 (1949), pp. 69-72.

Review of improvements in the cellulose acetate foil lamination process for paper, the mounting of maps, containers for unbound records, and the rebinding of bound records.      RJG

625. KISHORE, RANBIR. Preservation of pencil writing. *Indian Archives*, 6 (1952), pp. 34-38, chart.

Instead of fixing pencil writing with skim milk and starch coatings, the writer advocates a fixative lacquer made by dissolving cellulose acetate plastic foil (5-6 percent) in methyl ethyl ketone, dioxane and alcohol (1:1:2). A solution of cellulose acetate foil (2-3 percent) in ethylene dichloride and alcohol (19:1) serves the same purpose. Chart shows behavior of graphite, red pencil, copying pencil and carbon copies to different treatments.      RJG

626. LAMBOT, H. J. Determination of the 'loading' in paper by micro-radiography. *Nature (London)*, 159 (1947), p. 676.

A letter detailing the use of characteristic X-radiation for the determination of the percentage loading of paper. RMO

627. LAUNER, HERBERT F. and WILSON, WILLIAM K. Photochemical stability of papers. *J. Res. Nat. Bur. Stand.*, 30 (1943), pp. 55-74.

By keeping the exposed paper at a temperature near 30°C. the authors show that many previous reports were misleading. Light from 330 to 750 millimicrons in wavelength bleached many papers discolored with heat or age. The yellowing commonly reported in similar tests evidently was influenced by the heat of the ultraviolet lamp. The effects of water vapor, oxygen, lignin, rosin, and ink are discussed. Order of photochemical stability of papers given as: new-rag, refined sulphite, old-rag, soda-sulphite, and newsprint. RLF

628. LEPESME, PIERRE. *La protection des bibliothèques et des musées contre les insectes et les moisissures*. Paris, Centre de perfectionnement technique, cours conférences, fasc. 1024, 1943, 16 pp.

Enumération des différentes espèces d'insectes nuisibles; moyens de lutte contre les moisissures et les insectes. Bibliographie: 37 références. RL

629. LEWIS, ARTHUR WILLIAM. *Basic bookbinding*. London, B. T. Batsford Ltd., 1952. 147 pp. viii numb. pls., illus.

Contents: Preface; Equipment; Materials; Basic operations; Binding a single-sectioned book; Preparing a multisectioned book; Case-bound books; Endpapers; Hollow-backed binding; Library style binding; Binding single sheets; Lettering a book; Appendix; Index. BMU

630. LIBERTI, SALVATORE. Analisi su un papiro trovato ad Ercolano. *Boll. ist. patol. libro*, 8 (1949), pp. 114-116.

Rapport d'examen d'un échantillon de papyrus carbonisé. RL

631. LONGO, LUIGI. Applicazione razionale degli ipocloriti per lo sbiancamento delle carte imbrunite. Uso del cloruro stannoso come anticloro. *Boll. ist. patologia libro*, 11 (1952), fasc. I-II, pp. 110-115.

Calcul stoechiométrique donnant la quantité d'acide chlorhydrique pour la neutralisation du bain d'hypochlorite. En acidifiant le bain de chlorure stanneux, les hydroxydes d'étain ne précipitent pas. RL

632. LONGO, LUIGI. Carta alterata da colore per acquarello contenente rame. Esperimenti e osservazioni su l'imbiancamento delle carte imbrunite continenti rame. *Boll. ist. patologia libro*, 7 (1948), pp. 21-26.

L'enlèvement de taches brunes, dues à la présence de cuivre dans les couleurs d'aquarelle sur un atlas imprimé au XVII-XVIII S. a pu se faire par des immersions dans du  $\text{KMnO}_4$  2 percent, puis dans de



l'acide oxalique 4 percent. Les dernières traces de cuivre disparaissent après un second traitement d'immersion, cette fois dans de l'acide acétique à 10 percent, suivi d'un lavage à l'eau courante. RL

633. LONGO, LUIGI. Eliminazione della carta di grasso e di cera. *Boll. ist. patologia libro*, 5 (Ja./Mar. 1946), pp. 16-17; *Lib. Lit.*, 1946/48, p. 309.

Translation of title: Removal of grease and wax spots from paper.

634. LONGO, LUIGI. Eliminazione di scritture e di macchie di inchiostro bianco su carta nera. *Boll. ist. patologia libro*, 5 (Jly./S., 1946), p. 88; *Lib. Lit.*, 1946/48, p. 309.

Translation of title: Removal of writing and spots of white ink from black paper.

635. LONGO, LUIGI. Metodo per rendere trasparenti la carta e la pergamena. *Boll. ist. patologia libro*, 5 (1946), pp. 113-116, 2 illus.

Mouillage avec un liquide à indice de réfraction élevé: mélange de 3 parties de benzène et 1 partie de sulfure de carbone. RL

636. LYDENBERG, HARRY MILLER, and ARCHER, JOHN. *The care and repair of books*. 3d rev. ed. New York, R. R. Bowker company, 1945. 123 pp., 2 pls.

Contents: The care of books in general; The care of books in the library; Some enemies of books; The repair and mending of books; The treatment of paper, vellum, etc.; The care of leather bindings; The treatment of cloth bindings; A list of references; Index. BMU

637. MINOGUE, ADELAIDE E. The repair and preservation of records. *Bull. Natl. Arch. (U. S.)*, no. 5 (Sept. 1943), pp. 1-56.

Contents: Preservation of paper records; Repair of loose papers; Preservation and repair of bindings, seals and parchments; Special precautions and recommendations. Conclusion. App. A: Specifications for writing paper of maximum purity for permanent records recommended by the National Bureau of Standards. App. B: Suggested equipment and supplies for the repair of records. App. C: Bibliography. RJG

638. MINOGUE, ADELAIDE E. Some observations on the flattening of folded (paper) records. *Amer. Archiv.*, 8 (1945), pp. 115-121.

Clips and rubber bands are removed and papers opened and smoothed by hand. The pile is placed in a tray in a room maintained at 95 percent R.H. for 2-3 hours. The papers are then gathered in small piles and ironed with an electrically-heated hand iron. A pile of blotters serves best as an ironing surface. Mangles may be preferred for ironing large maps. Several practical suggestions and useful hints are given. RJG

639. MINOGUE, ABLAIDE E. Treatment of fire- and water-damaged records. *Amer. Archiv.*, 9 (1946), pp. 17-25.

Current inspection, first aid, repair to maps and volumes, large scale rehabilitation, later salvage. RJG

640. MORI HACHIRŌ 森八郎. Studies on the control of insects noxious to ancient art materials. I. On the insecticidal methods with reduced pressure. *Sci. Pap. Japn. Antiques*, no. 1 (Jan. 1951), pp. 30-32.

Reduced pressure is effective for insecticidal methods. Heating of the objects under 20-40 mm Hg and the use of chloropicrin at 20 mm Hg were found to be most effective. II. Insecticidal action due to the decrease of humidity. *Ibid*, No. 3 (Jan. 1952), pp. 30-35. Relative humidities of 0, 17, 28.3, 43, 71, 88 and 100 percent were produced by saturated solutions of  $P_2O_5$ ,  $ZnCl_2$ ,  $CaCl_2$ ,  $Ca(NO_3)_2$ ,  $NaCl$ ,  $KNO_3$ , and water. *Sitophilus oryzae* L. was tested in these relative humidities at 0, 5, 10, 15, 20, 25, 30, and 38 percent. Insecticidal action due to decrease of humidity became remarkable in cases of relative humidities less than 30 percent. KY

641. NIXON, H. M. Lamination of paper documents with cellulose acetate foil. *Archives (Brit.)*, no. 2 (Michaelmas 1949), pp. 32-36.

The author reviews the methods of Barrow, that of the British Museum (D. L. Evans), and Miss Minogue's account. Concludes by summarizing his feelings on lamination as: (1) Lamination involving the use of heat and pressure is safe, but would rather try it out for some years before using it for important archives. (2) A roller press is to be preferred to the flat-bed type. (3) Mass production suitable for large quantities of material involves an outlay for equipment. It is quicker than silk gauze but there is a certain amount of preparation of each sheet necessary before lamination. (4) Requires certain amount of skill but nothing like that required for the older process. (5) Lamination with acetate foil does not greatly increase strength of document—makes it less prone to damage. (6) Lamination with acetate foil has advantages over materials such as silk gauze, which is subject to decay.

These experiences in America suggest strongly that the theories will work out in practice. BMU

642. PLENDERLEITH, HAROLD JAMES. Some aspects of the preservation of museum-materials of organic origin: paper, textiles, wood. *Nieuws-bull. Kon. Neder. Oud. Bond* (1952), pp. 39-42.

Énumération et modes d'application de produits fongicides et insecticides, de produits de nettoyage des textiles et de matières plastiques de protection. RL

643. RADLEY, J. A. Deciphering of charred documents. *Analyst*, 75 (1950), pp. 628-629; *C.A.*, 45 (1951), 914i.

Grant (*C.A.*, 36 (1942), 5443<sup>3</sup>) reviewed the methods available for deciphering charred documents, but here are some further obser-

variations: Carefully paint the remains with a 25 percent solution of gum arabic and then with a soft camel-hair brush apply pure  $\text{TiO}_2$  in 25 percent gum arabic solution. In a desiccator containing strong fumes of Cl or Br, allow it to remain for 30 minutes and then "gas" in a desiccator containing  $(\text{NH}_4)_2\text{S}$ . This will cause the development of any Fe left as residue from Fe-gall ink. If necessary repeat the Br and moist-air treatments. Usually the document can then be photographed. Instead of treating with sulphide, a light painting with 5 percent  $\text{K}_4\text{Fe}(\text{CN})_6$  often is effective. A modification of Murray's method (*Nature*, 148 (1941), p. 199) has proved excellent with printings, typing, carbon copies, iron-gall writing inks, and lithographic prints. Immerse the paper in 5 percent  $\text{AgNO}_3$  which has been treated with just enough  $\text{NH}_4\text{OH}$  to dissolve the precipitate that first forms. Keep at about  $80-95^\circ$ . A silvery outline of the printed, typed, or written matter appears on the darker background, or the writing may appear black on a silvery background. The reproduced matter is best read or photographed while the document is immersed. The behavior of penciled writing in this test is very erratic.

644. The restoration of archive documents. *Figaro littéraire*, Feb. 9, 1952; *ICOM News*, 5 (Aug. 1952), p. 30.

An illustrated article on the work carried out at the restoration department of the Archives de France for the conservation of a precious document: The parchment attacked by moisture and mold is first placed between two sheets of wire gauze and dipped in a laboratory bath. It is immersed in two solutions, first of calcium hydrate, then calcium bicarbonate. These preparations neutralize the acidity of the paper and inks (it sometimes happens that the ink eats through the parchment). After drying several hours the document is placed on a sheet of special rag paper soaked in cellulose acetate. The parchment is fixed by means of a brush dipped in paste containing acetone. The "pieces" missing are cut out in the rag paper with a scalpel. After another sheet of rag paper has been applied to the other surface of the document it is then passed through a laminator where it remains for 25 seconds at a temperature of  $150^\circ$ . The restorers then examine the document. The "pieces" which replace worn-away parts bear no writing but at least the manuscript is saved from further deterioration.

RJG

645. Restoration of war-damaged manuscripts; charred treasures of Chartres. *I.L.N.*, 208 (1946), p. 159.

A page of photographs of the restoration at the Bibliothèque Nationale of charred remains of books. No technical details are given.

MB

646. RIDER, FREMONT. *Compact book storage*. Some suggestions toward a new methodology for the shelving of less-used research materials. New York, Hadham press, 1949.

Contents: The fundamentals of book storage; The storage segregation of much-used books; The Rube Goldberg chapter; Rolling and

hinged stacks; The factors involved in our conventional form of stack storage. Synthesis: More compact storage in our present stacks; Effecting a more compact book "presentation"; The relative economy of "compact storage"; Some objections advanced against compact storage; Some byproducts advantages of "boxing."

Two pictures which show clearly what "compact storage" accomplishes; 396 volumes conventionally shelved used  $3\frac{1}{2}$  tiers of shelf space—using "compact storage" the same books occupy  $1\frac{3}{4}$  tiers.

Reviewed in: *Library Q.*, 20 (July 1950), p. 212; *Sch. & Soc.* 71 (Ja. 28, 1950), p. 64; *Springfield Rep.*, May 28, 1950, p. 5C. BMU

647. SMALLCOMBE, W. A. La conservation des objets et documents de musée; expériences au cours de la seconde guerre mondiale. *Museum (Paris)*, 55/56 (1946), pp. 7-15.

An account is given of the precautions taken to save the objects and documents on parchment and paper of the Reading Museum. These were taken to a nearby limestone quarry, having a relative humidity of about 100 percent and a temperature of 10°C. Main enemies hence were humidity and mold. Experiments with and results given by naphthalene, paradichlorobenzene, carbon tetrachloride, paratrinetrophenol, and silica-gel are described. PC

648. SMITH, L. HERMANN. Manuscript repair in European archives. I. Great Britain. *Indian Archives*, 2 (1948), pp. 90-111. Reprinted from: *Amer. Archiv.*, 1, no. 1 (Ja. 1938).

A survey of the methods employed for repairing paper records, books, parchment, manuscripts, and seals in the Public Record Office (London), University Libraries (Oxford and Cambridge), British Museum, County Archives (Bedfordshire, Suffolk, Norfolk), and National Library of Wales. Bibliography. RJG

649. SMITH, L. HERMANN. Manuscript repair in European archives. II. The Continent. *Indian Archives*, 3 (1949), pp. 96-122. Reprinted from: *Amer. Archiv.*, 1, no. 2 (Apr. 1938).

A survey of methods employed for records preservation at the Archives Nationales (Paris), Bibliothèque Nationale (Paris), Archives Générales du Royaume (Brussels), Algemeen Rijksarchief (The Hague), Preussisches Geheimes Staatsarchiv (Berlin-Dahlem), Reichsarchiv (Potsdam), Hauptstaatsarchiv (Munich), Haus-, Hof-, und Staatsarchiv (Vienna), Nationalbibliothek, Handschriften—Sammlung (Vienna), Archivio di Stato (Venice), Biblioteca Apostolica Vaticana (Rome), and several private establishments. Bibliography. RJG

650. U. S. National archives. *The rehabilitation of paper records*. Washington, D. C., 1950. 7 pp. (Staff information paper, no. 16.)

Contents: Covers; Physical components of records including paper, parchment, writing inks, lead pencils, printing inks, typewriter inks, carbon paper; Binding materials; Methods of rehabilitating records including lamination, silking and binding materials; Need for rehabilitating records; Criteria for selective rehabilitation, etc. RJG



651. VERONA, ONORATO. Recenti acquisizioni sopra il processo di decomposizione microbica della cellulosa. *Boll. ist. patologia libro*, 7 (1948), pp. 26-39, 4 illus.  
Aperçu bibliographique depuis 1939 avec 63 références. RL
652. ZANGHERI, SERGIO. Su alcuni Anobiidae dannosi ai libri. *Boll. ist. patologia libro*, 10 (1951), pp. 29-33, 3 illus.  
L'étude entomologique de quelques *A.* prélevés sur des livres anciens a permis la détermination des quatre espèces: *Stegobium paniceum* L., *Gastrallus immarginatus* Müll., *Nicobium castaneum* Ol. var. *birtum* Ill., *Petalium (Gastrallomimum) unistriatum* Pic. RL

### I. WOOD

653. BAKER, WILLIAM J. How wood dries; information reviewed and reaffirmed. *F.P.L. Report R1642* (rev. 1951). 7 pp., charts.  
Discusses the movement of moisture in wood during the process of drying and the factors affecting this movement; presents formulas for the calculation of moisture content at midthickness of a board or plank and of the time required to dry different sizes of the same species of wood.
654. BARKAS, WILFRED W. Sorption, swelling and elastic constants of the cell wall material in wood. *Trans. Faraday Soc.*, 42 B (1946), pp. 137-150.  
A basic theoretical discussion of the physical properties of cell wall material and their modification occasioned by the porous nature of wood cells. RDB
655. BARKAS, WILFRED W. The swelling of wood under stress; a discussion of its hygroscopic; elastic and plastic properties based on a course of lectures. Stockholm, Sweden, Mar. 1948. London, H. M. Stat. Off., 1949. 103 pp., tables. (Gt. Brit. FPRL Special report.)  
Contents: Introduction; Structure, sorption and swelling; Anisotropic elasticity; Swelling stress in elastic gels; Plasticity; Sorption hysteresis; References; Index; Symbols. RDB
656. BOEHM, ROBERT M., and HARPER, JOHN S. Notes on wood, plywood and hard board. *Paper trade J.*, 128 (1949), pp. 24-26; *C.A.*, 43 (1949), 7683.  
The processes used by the Masonite Corporation in the manufacture of low- and high-density wood-fiber boards are described.

657. BONAVENTURA, GUSTAVO. Danni al legname in opera da parte di *Camponotus ligniperda*, Latr. *Boll. ist. patologia libro*, 8 (1949), pp. 56-60, 2 illus.

L'attaque d'un bois de sapin, attribuée à des termites est imputable en réalité à une espèce de fourmis, dont l'auteur donne la description. Comme moyen de lutte il préconise un appât empoisonné. RL

658. BRØGGER, ANTON WILHELM, and SHETELIG, HAAKON. *Vikingskipene*. Oslo, Dreyer, 1950. 295 pp., illus.

Innhold: Forord; Båtene fra de eldste tider; Båtgraver og skipsgraver; Vikingskipene; Sagatid og Middelalder; Register.

Reviewed in: *Antiquity*, 25 (1951), pp. 218-219. IG

659. BROWNE, F. L., and LAUGHNAN, D. F. Paint performance on forest products. *F.P.L. Report D1926*, May 1952.

Test fence investigations during the past 22 years are reviewed, including treatment of wood surfaces with chemicals; antishrink treatments by acetylation, or impregnation with phenolic resins; coverings of paper, resin-impregnated paper or pulp board, and resin-bonded sawdust; and mechanical alteration of wood surfaces by striation.

660. BROWNE, F. L. Water-repellent preservatives for wood. *Arch. Rec.*, 105 (Mar. 1949), pp. 131-132, 174.

The nature, composition, characteristics, and appropriate uses of water repellents, water-repellent preservatives, NSP preservatives, wood sealers, and preservative wood sealers are briefly described for nontechnical readers.

661. BROWNE, F. L. Wood properties and paint durability. *USDA Misc. Publ.*, no. 629 (July 1947). 10 pp., illus.

The reasons why some kinds of wood hold coatings of house paint longer than others are explained. The native woods are classified for paint-holding power. Suggestions are made for getting the best possible paint life on the less desirable kinds of wood.

662. BROWNE, F. L. Wood properties that affect paint performance. *F.P.L. Report R1053* (rev. 1951).

The physical structure and chemical composition of wood, as they affect its paintability, are discussed. The normal way in which paint wears out on wood (under exterior exposure) and the influence of specific gravity, rings per inch, and angle of grain on the durability of paint coatings are described. Native species are classified for paintability.

663. BUCK, RICHARD D. A note on the effect of age on the hygroscopic behavior of wood. *Conservation*, 1 (Oct. 1952), pp. 39-44, tables.

Measurements were made on the response of 12 specimens of wood, ranging from one year to 3,700 years in age, to changes in relative hu-

midity from 20 to 80 percent. The oldest specimens behaved much like recent wood in respect to weight and dimensional changes. Hence dimensional stability is not a merit that can safely be attributed to old wood. RJG

664. BURR, H. K., and STAMM, ALFRED J. Diffusion in wood. *J. Phys. & Colloid Chem.*, 51 (1947), pp. 240-261.

Rate of diffusion of water through wood compared with theoretical equations of Stamm. Various soft and hard woods compared. RLF

665. CASSELMAN, RALPH. Resin impregnation of wood. *Mech. Eng.*, 65 (1943), pp. 737-738.

An outline is given of the advantages of, and reasons for, resin impregnation of wood, with data on tensile properties. SR

666. COCKRELL, R. A. Explanation of longitudinal shrinkage of wood based on interconnected chain-molecule concept of cell-wall structure. *Trans. Amer. Soc. Mech. Engrs.*, 69 (1947), pp. 931-935; *C.A.*, 42 (1948), 1049.

The apparently anomalous behavior of wood in longitudinal shrinkage can be explained by the theory that "cellulose is a continuous matrix of overlapping chain molecules which is perforated by a continuous system of intermicellar capillaries." Any loss in moisture below the fiber-satn. point is accomplished by contraction as the chain molecules approach each other and elongation as the affixed ends of the chain molecules are pushed apart. Changes in length along the grain of wood that accompany loss in moisture are the resultant of these two movements, combined with the effects of the angles (spiral pitch) made by the fibrils with the longitudinal fiber axis and the equalizing of the differences between summerwood and springwood. A mathematical proof of the validity of this shrinkage theory is presented.

667. CURWEN, E. CECIL. Implements and their wooden handles. *Antiquity*, 21 (1947), pp. 155-158.

Iron, bronze and flint sickles and axes and the influence of the material used for the blade on the method of hafting. IG

668. DAVIS, G. H. Boat-building over 2500 years ago; Humber craft reconstructed. *I.L.N.*, 209 (1946), p. 551.

A page of drawings (by special artist, G. H. Davis, with the co-operation of the late Sir Geoffrey Callender) to illustrate the construction of a carvel-built canoe, 45 feet in length, and approximately 4 feet wide. MB

669. DORLAND, ROGER M. Hydrolysis of lignocellulose—the Masonite process in the war effort. *Chem. Eng. News*, 22 (1944), pp. 1352-1356; *C.A.*, 38 (1944), 6093.

A survey is given of the Masonite process and some of its products, including Presdwoods, S-2-S products (hardboards), die stock (substitute for steel dies), reflector board for fluorescent lighting, loft board for aircraft and ship-building industries, Benalite, etc. The hemicellulose fraction can be converted to furfural, AcOH, HCO<sub>2</sub>H, and other organic compounds.

670. DOWNS, LESLIE E. Bleaching wood. *F.P.L. Report* R1705 (1950). 9 pp.

Methods of bleaching wood are described very briefly; a bibliography and a partial list of manufacturers of bleaching materials are included.

671. DUDLEY, HAROLD E. The one-tree boat at Appleby, Lincolnshire. *Antiquity*, 17 (1943), pp. 156-161.

Description of ancient repairs.

IG

672. ELGEE, H. W., and F. An early Bronze Age burial in a boat-shaped wooden coffin from Northeast Yorkshire. *P.P.S.*, 15 (1949), pp. 87-106.

Description of the construction of the dugout canoe.

IG

673. ESPENAS, L. D. Some wood-moisture relations. *F.P.L. Report* R1648 (rev. 1951). 9 pp.

Describes how water is held by wood, amount of water in green wood, fiber saturation point, and the effects of moisture on the properties of wood.

674. FAY, J. B. Technical notes. *M.J.*, 47 (Dec. 1947), p. 169.

Description of the use of Cerric clear lacquer 2D204 and Cerric matt wax 7M33 to treat wood to prevent it becoming ingrained with dust.

IG

675. FISHER, R. C. Wood-boring insects in beech furniture. *Nature (London)*, 155 (1945), p. 116. (Letter to the editor.)

Neither *Lyctus* nor *Xestobium* normally occurs in beech, although serious damage can be caused by the common furniture beetle (*Anobium punctatum*) and, less commonly, by *Ptilinus pectinicornis*. LB

676. GALLO, ALFONSO. La lotta antitermitica in Italia. *Boll. ist. patologia libro*, 11 (1952), fasc. I-II, pp. 3-34, illus.

Aperçu général de la question: description des insectes, historique, rôle de l'Istituto di patologia del libro, organisation de la lutte, prophylaxie et constructions antitermites, insecticides, travaux d'assainissement.

RL

677. Gt. Brit. Dept. of scientific and industrial research. Dry rot in buildings; recognition, prevention and cure. *F.P.R.L. Leaflet*, no. 6 (July 1931), 5 pp.



678. HAUGE, TORBJÖRN ANDREAS DANNEVIG. *Konservering av tre*. Universitetets Oldsaksamlings Arbok, 1949-1950. Oslo, 1950. 33 pp., 6 illus.

Méthode de traitement d'objets en bois provenant de fouilles, consistant en une imprégnation à chaud par une solution aqueuse d'alun. L'appareillage du Statens Historiska Museum de Stockholm est décrit.

RL

679. HORNELL, JAMES. The sailing ship in ancient Egypt. *Antiquity*, 17 (1943), pp. 27-41.

Part I. The hull. Part II. Mast and sails with details of construction.

IG

680. JAHN, EDWIN C., and HARLOW, WILLIAM M. Chemistry of ancient beech stakes from the fishweir. *Papers Robt. S. Peabody Found. Archaeol.*, 2 (1942), pp. 90-95. (Reprint from: *The Boylston street (Boston) fishweir*); *C.A.*, 36 (1942), 4707.

Microscopic examination of the buried beech stakes shows that the wood has retained its structure more or less intact. However, the material behaved very unlike normal wood in its reactions to 72 percent  $H_2SO_4$  and other reagents when observed under the microscope. Microchemical studies of the stakes, their behavior when viewed between crossed nicols, and the X-ray analysis indicate that the cellulosic portion of the wood has suffered losses and that what cellulose remains is in an unoriented condition. Chemically, 75 percent of the dry tissue of the ancient stakes is lignin; recalculation of the analytical values shows that none of the original lignin was lost, nor was there any accumulation of "apparent" lignin by the alteration or decomposition of other constituents. Based on the original density of the wood, there has been some increase in the ash content and the alcohol-benzene-soluble extractives, whereas most of the pentosans (about 91 percent) and cellulose (about 95 percent) have been lost. The very high reducing power of the ancient wood, despite its low polysaccharide content, indicates that this small fraction of cellulose material is highly degraded; probably it is an oxycellulose with a high proportion of CO and  $CO_2H$  groups. It is also likely that the molecular chains are greatly shortened, as may be deduced in part from the X-ray analysis. The analysis of the ancient beech (oven-dry basis) is: d. 0.15-0.168, Cu no. 10.5, hydrolysis no. 18.2, ash 3.45 percent, alcohol-benzene-soluble 6.56 percent, pentosans 7.96 percent, lignin (ash-free) 74.68 percent, cellulose (lignin-free) 11.54 percent.

681. KLEIN, LOUIS, GRINSFELDER, HENRY, and BAILEY, S. D. Comparison of methods for improving wood. *Ind. Eng. Chem.*, 36 (1944), pp. 252-256; *C.A.*, 38 (1944), 3442.

Phenolformaldehyde resin has been widely used to improve the physical properties of wood. It is applied by either (1) impregnation

and compression, (2) bonding of veneers with a resin film and compression, (3) liquid resin bonding with glue spreaders and compression. Process (1) increases water resistance, dimensional stability and strength. Processes (2) and (3) increase the strength and modulus of elasticity. The optimum veneer moisture content is 10 percent and temperature 330°F. for 30 minutes. Final product has a specific gravity more than 1.34. Process (2) imparts the greatest number of superior properties.

682. KLINE, GORDON M., REINHARD, FRANK W., RINKER, R., and DELOLLIS, N. Effect of catalysts and pH on strength of resin-bonded plywood. *J. Res. Nat. Bur. Stand.*, 37 (1946), pp. 281-310.

An investigation of the strength of plywood bonded with cold- and hot-set resins of the phenol-formaldehyde and the urea-formaldehyde type. Over 30 proprietary resins tested. High acidity of the applied adhesive caused a weaker bond to be formed. RLF

683. KUBO TERUICHIRO, KATAOKA SUMIKO, KINYU HISASHI, NAKAJIMA TOSHIO, YAGYU KOKEN, and YAMAMOTO MASAICHI. Physical and chemical examination of wood, V-IX. *J. Soc. Chem. Ind. Japn.*, 47 (1944), pp. 929-940; Cf. *Ibid.*, 44 (1941), p. 651; *C.A.*, 42 (1948), 6076.

In the Japanese cypress wood 250-1213 years old in the Horyuji Temple, Nara Prefecture, the density increased with age, but the chemical compounds changed very little. Absorptive power for moisture decreased with age, but the swelling due to moisture absorption in the direction parallel to annual rings increased, while the swelling in the direction perpendicular to annual rings changed irregularly. The amount of water absorbed on immersion in water for a short time is the greater the newer the wood, but the maximum swelling is shown by the oldest wood. There is little change in crystalline structure. The nitratability of the cellulose was higher for older timber; the degree of polymerization decreased with age, especially at the outer portion. In general mech. strength increased with age. Heat of combustion increased first rapidly but then gradually with age.

684. LEASK, HAROLD GRAHAM. Ancient objects in Irish bogs and farm lands. *Ulster J. Ant.*, 6 (1943), p. 147.

A review of the guide to the first-aid treatment of objects found in bogs, especially wooden objects. IG

685. LETHBRIDGE, T. C. Report on a recently discovered dug-out canoe from Peterborough. *P.P.S.*, 16 (1950), pp. 229-230.

Construction described.

IG

686. MACLEAN, J. D. Effect of moisture changes on the shrinking, swelling, specific gravity, air or void space, weight, and similar properties of wood. *F.P.L. Report R1448* (rev. 1952). 28 pp. tables, charts.

Discusses moisture content, fiber saturation point, moisture equilibrium, weight of wood substance and water per unit volume; volume occupied by wood substance, water and air space; and factors affecting shrinking, swelling, and specific gravity. Formulas and charts show methods for computing shrinkage, swelling, specific gravity, and other variables.

687. MARX, ERIC. Ancient Egyptian woodworking. *Antiquity*, 20 (1946), pp. 127-133.

Types of wood used, tools, mitres, mortices, glue, and methods of construction. IG

688. MILLET, M. A., and STAMM, ALFRED J. Wood treatment with resin-forming systems; a study of size and species limitations. *Mod. plastics*, 25 (1947), pp. 125-127; *F.P.L. Report* R1703.

The effectiveness of the treatment of solid wood with phenolic and urea resins on dimensional stabilization and hardness.

689. MORI TÔRU 森徹, and ASANO IKUO 浅野猪久夫. Prevention of decay and insect damage of wood. I. Study on the rate of decay of wood. *Sci. Pap. Japn. Antiques*, no. 1 (Jan. 1951), pp. 43-49; II. Test on the antifungal power of PCP infused in wood blocks. *Ibid.*, no. 2 (Oct. 1951), pp. 23-29; III. Preservative treatment against fungi of lower end of pillars. *Ibid.*, no. 4 (Nov. 1952), pp. 23-26.

The minimum amount of sodium salt of pentachlorophenol (PCP) required for killing *Poria vaporaria* in the Petri dish was found to be 0.008 percent by weight. Blocks of heart wood of *Cryptomeria japonica* infused with PCP were used for determining the minimum amount of PCP showing toxicity against the same fungus and the value 7.3 mg per cc of wood was obtained. As Na salt of PCP is soluble in water, protection against rain or moisture is necessary when the wood blocks are used outdoors or in damp places. Blocks of wood, *Hinoki* and *Keyaki*, were immersed for 3 days in the solution of sodium salt of pentachlorophenol and the amount absorbed was determined by the weight increase. The depth of impregnation was 10 mm for *Hinoki* and 2-3 mm for *Keyaki* at the cross section of the wood. To make the absorbed salt insoluble, 2-3 percent copper sulfate solution was painted on the wood with a brush with good results. KY

690. MOSS, A. A. Preservation of a Saxon bronze-bound wooden bucket with iron handle. *M.J.*, 52 (Oct. 1952), pp. 175-177.

After taking the bucket apart the water-logged staves of yew were treated in a bath consisting of  $\frac{3}{4}$  part potash alum, 1 part glycerine, and 1 part  $H_2O$  (by wt.) at 95°C. for 3 hours. After rapid rinsing in warm water to remove excess alum the wood was allowed to remain in open air 3 weeks before coating with a dilute solution of cellulose nitrate. The corroded bronze bands were reduced electrolytically in

a 5 NaOH percent solution at 1 ampere for 6 hours. The rusted iron handle was only mechanically strengthened. Details of assembly are described and illustrated. RJG

691. MOUNTFORD, C. B. An unrecorded method of manufacturing wooden implements by simple stone tools. *Trans. Roy. Soc. S. Australia*, 65, no. 2 (1941), pp. 312-316, pl. Research item in: *Nature (London)*, 151 (1943), p. 56.

Possible methods of early man suggested by the description of modern Stone Age man. LB

692. ŌTSUKI TORAO 大槻虎男. On the destructive damage of the temple Yakushi-ji caused by a mould. *Sci. Pap. Jap. Antiques*, no. 1 (Jan. 1951), pp. 18-21.

Three pillars of the Golden Hall of Yakushi-ji temple, Nara, were destroyed by the mold *Merulius lacrymans* (Wulf.) Fr. in 1947. KY

693. PECK, EDWARD C. Moisture content in wood in use. *F.P.L. Report* R1655 (rev. 1950). 4 pp., table, maps.

Lumber should be seasoned to a moisture content in keeping with the average moisture content it will have during its useful life. Report presents charts and tables indicating average moisture content attained by interior woodwork in January and July throughout the United States.

694. PECK, EDWARD C. Shrinkage of wood. *F.P.L. Report* R1650 (1947), 6 pp., tables, charts.

Discusses the effect of wood structure on shrinkage, the moisture content-shrinkage relationship, shrinkage variability, and the effects of shrinkage. Also contains table of shrinkage factors for commercial species.

695. Plasticizing of wood in review, *Pacific Plastics*, 2 (June 1944), pp. 29-31.

Materials and methods used in incorporating synthetic resins with wood to form objects with more desirable properties. SR

696. Princess Risborough, Eng. Forest products research laboratory. *Decay of timber and its prevention*, by K. St. G. Cartwright, and W. P. K. Findlay. London, H.M.S. Off., 1946. 294 pp., illus.

Contents: Ch. I. Causes of decay. . . . Ch. VIII. Rots of timber in buildings and structures. . . . Ch. XI. Deterioration of composite wood and manufactured wood products. . . . Ch. XIII. Preservation of wood by chemicals.

Reviewed in: *M.J.*, 48 (Oct. 1948), p. 156.

IG



697. Properties of wood related to drying (information on the seasoning characteristics of wood helpful in understanding kiln-drying problems. *F.P.L. Report* R1900-1 (June 1951).

Contents indicated by title.

698. RITTER, G. J., and MITCHELL, R. L. Fiber studies contributing to the differential shrinkage of cellulose. *Pap. Ind.*, 33 (Jan. 1952), pp. 1189-1193.

The lesser radial shrinkage of wood as compared to tangential shrinkage is accounted for by the crystallite structure around the pits, which are predominantly in the radial wall. Data are presented that show that the ray cells do not restrain radial shrinkage.

699. ROE, F. GORDON. From true to false; a second study in woodcraft. *Connoisseur*, 120 (1947), p. 92.

Subsequent to *loc. cit.* 117 (1946), p. 95. Further examples. Discusses the appearance produced by natural as distinct from artificial wear in wooden objects. SRJ

700. SEBORG, R. M., MILLET, M. A., and STAMM, ALFRED J. Heat-stabilized compressed wood (Staypak). *F.P.L. Report* 1580 (rev. 1948). 11 pp., tables, charts.

Describes method for making a tough compressed wood that contains no stabilizing resin within the cell wall structure but still does not recover from compression under swelling conditions, due to relief of internal stresses caused by a limited flow of lignin cementing material under the pressing conditions.

701. SPACKMAN, WILLIAM, JR., and TIPPO, OSWALD. Wood preservatives; effect on seam compounds and value as paint primers. *Ind. Eng. Chem.*, 40 (1948), pp. 1301-1308; *C.A.*, 42 (1948), 8409b.

Wood preservatives consisting of either chlorinated phenols, Cu naphthenate or phenyl Hg oleate plus a water-repellent material dissolved in a distillate fuel oil, conforming to Bureau of Ships Specification 52P46, have no deleterious effect on the adherence or other significant properties of seam compounds; a 24-hour drying period must elapse between treatment of wood and filling of seams. The method of applying the preservative (brush, dip, or hot and cold bath) has no effect. Solutions of this type have little value as paint primers. Cu naphthenate shows a tendency to bleed through a paint film; bleeding is materially reduced by the use of a good primer.

702. STAMM, ALFRED J. Modified woods. In *Modern plastics encyclopedia*, 1948. New York, Plastics catalogue corporation, 1948.

In condensed style discusses the various methods of modifying the properties of wood, and for each of the more successful new products (impreg, compreg, staypak, staywood, acetylated wood, and formaldehyde-treated wood) describes processing, properties and applications, and cites literature. RDB

703. STAMM, ALFRED J. *Modified woods; report of American wood-preservers' association, April 1946*. Madison, Wis., Forest products laboratory, 1946. 18 pp.

Dimensional stabilization of woods may be influenced or attained in various ways: 1. With surface coatings. These do not prevent passage of moisture but retard it sufficiently so that under rather rapidly oscillating relative humidity conditions they do reduce swelling and shrinking effectively. 2. With internal coatings of the capillary structure. This can be done with wax carried into cell structure with ethylene glycol mono-ethyl ether to replace water. This retards rate of swelling but final swelling is unaffected. 3. With a hygroscopic treating agent like sugar or a salt. This is unsatisfactory for several reasons. 4. By heat treatment. This causes chemical changes with resulting darkening and loss of strength. 5. By chemical blocking of hydroxyl groups. By forming a phenol-formaldehyde resin throughout the cell structure, it is possible to reduce the hygroscopicity and equilibrium swelling of wood 25 to 35 percent of normal. Wood treated this way is conveniently termed "impreg." Treatment is best carried out on thin plies of green wood with phenol-formaldehyde resinoid in a chamber by different methods, some under pressure. Impreg. treatment also imparts to wood considerable resistance against decay and termite and marine borer attack. Compreg. is a name given by the Forest Products Laboratory to the stable form of resin-treated compressed wood which is highly compressed prior to the setting of the resin. It has higher density than impreg. 6. By causing the lignin-cementing material between cellulose fibers to flow sufficiently to eliminate internal strains. This is done by heat and the product is called "Staypak." 7. By heat treating the wood under non-oxidizing conditions. The wood is heated 500–600° F. for a few minutes in a bath of molten metal or fused salt. Hygroscopicity and equilibrium swelling are reduced to half normal. There is some loss in strength properties. This is the simplest and most economical method of modifying wood. Bibliography. RJG

704. STAMM, ALFRED J. Passage of liquids, vapors and dissolved materials through softwoods. *USDA Tech. Bull.*, 929 (1946).

A comprehensive analysis of the passage of liquids through softwoods under both diffusion and pressure permeability conditions is given. The analysis is extended to the case of drying wood, taking into account free liquid, bound liquid and vapor movements. Theoretical diffusion constants are calculated.

705. STAMM, ALFRED J. Passage of materials through wood, paper, cellulose membranes, and fabrics. *TAPPI*, 32 (1949), pp. 193–199.

A review of the principles of permeability and diffusion of materials through wood.

706. STAMM, ALFRED J. Stabilizing the dimensions of wood. *U. S. Dept. of Agriculture. Yearbook* (1950/51), pp. 807–879.

A brief survey of the present methods for stabilizing the dimensions of wood by bulking, chemical reaction with the hydroxyl groups, and cross linking.

707. STAMM, ALFRED J. Wood. *Ind. Eng. Chem.*, 43 (1951), pp. 2276-2279.

The literature is reviewed on new developments (1949/51) in preservative and fire-retardant treatments for wood, strength properties of wood, wood structures, and production and properties of plywood, laminated wood, modified woods, and fiberboards from the standpoint of chemical engineering interest. A table of properties of fiberboards is given.

708. STAMM, ALFRED J., and SEBORG, R. M. Forest products laboratory resin-treated, laminated, compressed wood (Compreg). *F.P.L. Report* 1381 (rev. 1951). 12 pp. table, chart.

Revision brings the laboratory's development of Compreg up to date. RDB

709. STAMM, ALFRED J., and SEBORG, R. M. Forest products laboratory resin-treated wood (Impreg). *F.P.L. Report* 1380 (rev. 1950). 10 pp., tables.

Methods for making dimensionally stabilized resin-treated compressed wood are given, together with modifications in properties and proposed uses. RDB

710. STAMM, ALFRED J., and TARKOW, HAROLD. Dimensional stabilization of wood. *J. Phys. & Colloid Chem.*, 51 (1947), pp. 493-505.

The different ways by which dimensional stabilization of wood has been attained are discussed. The dimensional stabilization of wood by acetylation is considered from the standpoint of various mechanisms. It is shown that the stabilization is primarily due to a bulking effect.

711. STAMM, ALFRED J., and TARKOW, HAROLD. Penetration of cellulose fibers. *J. Phys. & Colloid Chem.* 54 (1950), pp. 745-753; *C.A.*, 44 (1950), 9145.

Fibers of pure cellulose and lignocellulosic materials such as wood can be directly penetrated only by polar liquids. These liquids, except for a small correction for adsorption compression, add their vol. to the vol. of the cell walls, indicating that they are not entering existing voids but are forming a solid soln. with the fibers. The extent to which a liquid will penetrate fibers and swell them appears to be dependent upon the ability of the liquid to form H bonds with the OH groups of cellulose and the lignin, and also upon the size of the liquid mols. Although solns. may penetrate the fibers much more slowly than the solvent in a no. of cases, they eventually swell wood more than does either component alone. This enhanced swelling can be explained on the basis of an equil. between sorption, soln. pressure, and structural resistance. Nonpolar liquids, which do not by them-

selves penetrate fibers, can replace polar liquids already in the fibers except for the unimolecularly held portion of the polar liquid. Only partially expanded aerogels can thus be made from cellulosic fibers.

712. STAMM, ALFRED J., and TARKOW, HAROLD. Wood, a limited swelling gel. *J. Phys. & Colloid Chem.*, 53 (1949), pp. 251-260.

The composition and structure of wood are briefly reviewed. Swelling is limited in the cell wall by the "hoop" tension of the spirally oriented micelles in the outer cell wall, a structure comparable to the corded carcass of a rubber tire. Loading cell walls with various materials, as resins, increases the volume by an amount equal to the volume of the loading material. Loading makes possible dimensional stabilization of wood, for although the dry dimensions of the wood are increased, the limiting water swollen dimensions are not affected.

713. TARKOW, HAROLD. Swelling and shrinking of wood, paper, and cotton textiles and their control. *Tappi*, 32 (1949), pp. 203-211.

A review with 15 references.

714. TARKOW, HAROLD, STAMM, ALFRED J., and ERICKSON, E. C. O. Acetylated wood. *F.P.L. Report* 1593 (rev. 1950). 15 pp., 10 tables, charts.

Describes a new method of stabilizing the dimensions of wood against swelling and shrinking by reacting wood with vapors of acetic anhydride in the presence of pyridine. Treatment gives the highest degree of dimensional stabilization thus far found without embrittling the wood, as with resin treatments.

715. U. S. Forest products laboratory, Madison Wis. Comparative strength of air-dried and kiln-dried wood. *F.P.L. Technical note* 180 (rev. 1952) 1 leaf.

Contents indicated by title.

716. U. S. Forest products laboratory, Madison, Wis. Fiber-saturation point of wood. *F.P.L. Tech. note* 252 (1944). 2 pp.

Contents indicated by title.

717. U. S. Forest products laboratory, Madison, Wis. Foreign woods imported into the United States, including a list of importers and dealers. *F.P.L. Report* R887 (1951). 11 pp.

Contents indicated by title.

718. U. S. Forest products laboratory, Madison, Wis. Shrinking and swelling of wood in use. *F.P.L. Report* R736 (rev. 1952), 10 pp., tables, map.

Contains a table of shrinkage values for wood of numerous species. The cause and effects of shrinkage are discussed and recommendations are made for minimizing shrinkage of wood items in service.



719. U. S. Forest products laboratory, Madison, Wis. Some reference books on domestic and foreign woods. *F.P.L. Report* R1479 (1950). 13 pp.

Some 150 titles of general works with bibliographical data and occasional notes.

720. VANDERWALKER, F. N. *Wood finishing, plain and decorative; method, materials and tools for material*. Chicago, F. J. Drake co., 1944. 361 pp.

Contents: Wood finishing in general; Preparation of old and new surfaces; Stains in general; Factory prepared stains; Water stains; Chemical water stains, acid and alkaline; Color pigment water stains; Spirit stains—*aniline* and coal tar dye stains; Oil stains; Varnish stains; Stain mixing—brushes and procedure—weights and measures; The mixing and use of wood fillers; Varnish and shellac; Varnishing, rubbing, polishing; Varnish defects and their causes; Lacquers—*pyroxylin nitrocellulose*, shellac, Chinese and Japanese; Wax finishes and oilrubbed finishes; Painted interior wood trim; Enameled interior wood trim; Schedules of working operations; Interior trim woods—descriptions of characteristics; Brush graining; Decorative wood finishes by glazing and highlighting; Repairing damaged finishes; Index. RJG

721. VEZZANI, RENZO. Difesa degli edifici e del legno dalle termiti. *Boll. ist. patologia libro*, 11 (1952), fasc. III-IV, pp. 23-74, 13 illus.

L'auteur traite successivement de la vie et des moeurs des termites, des mesures de protection en général, de la destruction des termites dans les édifices et les bois infestés, de l'emploi de bois résistant ou traité, des mesures à prendre contre les termites dans les nouvelles constructions et de la défense d'édifices existants. RL

722. VOGT, EMIL. The birch as source of raw material during the Stone Age. *P.P.S.*, 15 (1949), pp. 50-51.

Birch bark used for pots and floors and applied to pots as decoration. IG

723. WALTON, JAMES. The development of the Cruck framework. *Antiquity*, 22 (1948), pp. 179-189.

Description of various methods of using straight or curved timbers to support a ridge pole. IG

724. WEATHERWAX, RICHARD C., and STAMM, ALFRED J. The coefficients of thermal expansion of wood and wood products. *F.P.L. Report* R1487 (1946). 24 pp., illus., tables, charts.

The coefficient of thermal expansion of solid wood and untreated and resin-treated laminated wood and plywood is reported. Equations for computing the coefficient of thermal expansion for different densities, resin contents, and constructions are given.

725. Wood (London). *Wood specimens; a series of selected timbers reproduced in natural colour with introduction and annotations* by H. A. Cox. London, The Nema Press, 194?, 206 pp., illus., 100 col. pls. BMU
726. WRIGHT, E. V. and C. W. Prehistoric boats from North Ferriby, East Yorkshire. *P.P.S.*, 13 (1947), pp. 114-138.  
Description of the excavation and salvage, details of the construction of the boats, timber and tool marks and reconstruction. IG

### J. FIBROUS MATERIALS AND TEXTILES

727. American society for testing materials. *Standard methods of identification of fibers in textiles*. Philadelphia, Pa., 1949. pp. 67-85, plates, tables. (A.S.T.M. Designation: D 276-49).  
Contents: Scope; Reference standards; Reagents; Apparatus; Considerations for sampling; Test specimens; Mounting specimens; Preliminary examination; Procedure for fibers with surface scales; Procedure for fibers with faint or pronounced cross-markings and swellings; Procedure for fibers with longitudinal striations; Procedure for twisted fibers; Procedure for fibers without markings; Appendix: Plates. RJG
728. ASTBURY, WILLIAM THOMAS. *Textile fibres under the X-rays*. London, Imperial chemical industries, ltd., 1943. 54 pp. incl. front. Noticed in: *Nature*, 152 (1943), p. 90, by F. I. G. Rawlins.  
Contents: Introductory; Single crystal rotation photograph; Fundamental calculations based on the rotation photograph; Natural silk (Domestic); Natural silk (Wild); Native cellulose; ramie, jute, hemp, coir, cotton; Disoriented native cellulose; Native cellulose—flax; Regenerated cellulose; Mercerisation; Regenerated cellulose; Acetate rayon; Mammalian hair; Avian and reptilian keratin; Collagen; Comparison photographs—collagen; Artificial fibrous proteins; "Lanital"; Synthetic fibres; "Vinyon"—"Nylon"; Dyed fibres; Sector comparison photograph; Mineral fibres. BMU
729. BELLINGER, LOUISA. Technical analysis [of dated Tiraz fabrics in the Textile Museum] In Kühnel, Ernst. *Catalogue of dated Tiraz fabrics*. Washington, D. C., National publishing company, 1952, pp. 101-120, pls., figs., charts. BMU

730. BELLINGER, LOUISA. Textile analysis; early techniques in Egypt and the Near East. Parts I-III. *Workshop notes, Pap. no. 2-3, 6* (Je. 1950, Apr. 1951, Nov. 1952), [12] pp., pls.

The basic techniques for each of the four principal fibers—linen, cotton, wool, and silk—woven alone are described. In Part II is described what happens when various fibers and techniques are brought together. Definitions of terms used in textile description are given. In Part III is traced the further evolution of loom set-up introduced by the wool weavers and which were subsequently adopted for silk weaving. RJG

731. BRUSSET, HENRY. Carbonization of cellulose. *Compt. rend.*, 224 (1947), pp. 1356-1358; *C.A.*, 41 (1947), 6044.

Powder and fiber diagrams, as well as the central diffusion method, have been used to study the solid state of bleached cotton in comparison with cotton heated to 185°, 242°, 257°, 284°, 314°, 340°, 430°, 465°, and 600°. Debye diagrams indicated for the first five samples, even when heated for 10 hours, the form of an oriented fiber with the same diffraction lines. However, the sixth to tenth samples gave diagrams characterized by a large ring, the center approaching the (002) line of graphite, as well as a ring corresponding to a spacing of 2.1 Å. Samples 6 and 7 had a more diffuse pattern than 8, 9, and 10, indicating a modification of the cryst. structure. By means of the Guinier arrangement, low-angle diffraction was studied for samples 1, 3, 5, 7, and 10. Low-angle diffraction could not be observed for the 1st and 3rd of these samples, whereas the fifth showed slight diffraction, and the others gave an intense, sharply defined diffraction. It is concluded that: (1) The cellulosic structure is retained up to about 300° in spite of an important modification of the material; (2) an amorphous structure, appearing at about 300°, persists throughout heating to higher temps; (3) loss of the cellulosic structure is accompanied by the appearance of a micellar structure.

732. CHARLESTON, R. J. Han damasks. *O.A.*, 1 (1948), pp. 63-81, illus.

The technique of weaving and the designs as related to the other arts in China from about 200 B.C. to A.D. 200. RMM

733. CROWFOOT, MRS. GRACE M. Textiles from a Viking grave at Kildonar, on the Isle of Eigg. *Proc. Soc. Ant. Scotland*, 83 (1948/49), pp. 24-28.

Description of the weave and possible reconstruction. IG

734. GÉRARD, R. Restauration et conservation des drapeaux. *Arch. Herald Suisses*, 62 (1948), pp. 53-63, 4 illus. Same article appeared in *SAMAB*, 4 (1948), pp. 209-213, illus.

The many causes of flag deterioration are reviewed. Prior to restoration photographic records should be made and even better water color sketches. These may outlast the original. Small tears are mended

with small patches of similarly colored silk attached with starch paste (or Kodak's white photopaste, from collapsible tubes, or made up from its powder). Fragmentary flags are pasted with this same paste to flags of artificial silk made up of the same design and colors. The restored flag is then fixed on a ground of cotton fabric in a frame with copper or brass tacks. The frame is backed with plywood which is impregnated with corrosive sublimate (mercuric chloride) 1:1000. Repair of flags by stitching to reinforce is not recommended. Suggestions are made for the display of old flags. Directions, illustrated by diagrams, are given for recognizing the "right" side of a flag based on the laws of heraldry. RJG

735. GREENE, FRANCINA S. Cleaning and mounting procedures for wool textiles. *Workshop Notes, Pap.*, no. 1 (n.d.), 4 pp., pl.

A case history of the cleaning and mounting of a Near Eastern woolen textile is described. Following microscopic identification of the fibers and determination of direction of twist, ultraviolet examination to detect patchwork, and tests for fastness of the dyes, the fabric is placed between Lumite screening of cloth weave to serve as a support. Lumite is a plastic which is not affected by any of the solvents or detergents used in the screening process. Stoddard solvent is used for degreasing and stains are reduced with an enzymic digestive agent called Parazyme dissolved in distilled water, then flushed. Washing is completed in a detergent bath using Igepal CA extra, 1:200 parts in distilled water. After tamping to remove grit, rinsing in a 10 percent glycerine bath and drying, the textile is mounted on Lumarith for storage or exhibited between two pieces of Plexiglas. All steps are well illustrated with photographs. RJG

736. HENSHALL, AUDREY. Textiles and weaving appliances in prehistoric Britain. *P.P.S.*, 16 (1950), pp. 130-137.

Woven textiles, spinning, Bronze Age plain and patterned weaves. Raw materials, weaving and spinning appliances, basketing and other similar fabrics, matting. IG

737. LEECHMAN, JOHN DOUGLAS. Preservation of fibre cordage in ethnological objects. *M.J.*, 44 (1944), p. 112.

Use of glycerine 59 percent, water 40 percent, formaldehyde 1 percent. Immerse cordage in tap water for 24 hours. Shake off water and immerse in glycerine solution for two weeks. IG

738. LEGGETT, WILLIAM FERGUSON. *The story of linen*. Brooklyn, N. Y., Chemical publishing co., 1945. 103 pp.

Contents: Foreword; Introduction; Flax; Ancient spinning and weaving; Linen during the Stone Age; The Phoenecian interlude; Linen in Egypt; Linen of the Hebrews; Linen in Greece; Linen in Rome; Linen in the Medieval twilight; Linen in Flanders; Linen in England; Linen in Ireland; Linen in Scotland; Linen in Colonial America; Ramie; Hemp; Sisal; Jute; Bibliography. BMU



739. LEGGETT, WILLIAM FERGUSON. *The story of silk*. New York, Life-time editions, 1949. 361 pp.

Contents: Foreword; Introduction; Fiber called silk; The silk moth and its cocoon; Wild silk moths; The mulberry tree; Silk in China; Silk in India; Silk in Japan; Silk in Persia; Silk in Egypt; Silk and the Arabs; Silk and the Hebrews; Silk in Greece; Silk in Rome; Silk in Byzantium; Silk in Sicily; Silk in Italy; Silk in Spain; Silk in France; Silk in England; Silk in Germany and the Low Countries; Silk in America; Notes on silk lace; Glossary; Bibliography. BMU

740. LEGGETT, WILLIAM FERGUSON. *The story of wool*. Brooklyn, N. Y., Chemical publishing co., 1947. 304 pp.

Contents: Foreword (by Sylvan I. Stroock); Man learns about wool; Sheep and their ancestors; The Merino sheep; Alteration of fleece; Wool and its allies; Wool and worsted; Felt, an ancient fabric; Wool and Swiss Lake dwellers; Wool in Egypt and India; Wool and the Hebrews; Wool in Mesopotamia; Wool in Greece; Wool in Rome; Wool in Medieval Italy; Wool in Spain; Wool in France; Wool in Flanders; Monastery wool; Wool in England; Cloth guilds of Europe; English cloth guilds; Wool in Ireland and Scotland; Wool in America; Wool in Peru; Wool in Australia; Cashmere; Mohair; Camel; Llama; Guanaco; Vicuna; Alpaca; Hybrid cameloid fibers; Miscellaneous fibers and furs; Origin of the names of woolen fabrics; Bibliography. BMU

741. LETISSIER, J. Damage caused by catalysis in bleaching with oxygen bleaches. *Teintex*, 5 (1940), pp. 269-273; *Chem. Zentr.*, Pt. 1 (1941), 2061; *C.A.*, 37 (1943), 4579.

A general discussion of  $H_2O_2$  bleaching; its mechanisms; practical methods of use; its effect on the fibers; the role of metal catalysts, especially Fe and Cu; the formation of readily decomposed metal peroxides (e.g.,  $Fe^{++} - Fe_2O_3 - Fe^{+++} - Fe^{++}$ ); the possibility of destroying the action of the catalysts by poisoning, as with HCN, HCNS,  $H_2S$ , and similar organic compounds; the interference of water glass, Na pyrophosphate or aliphatic alcohol sulfonates with the splitting off of  $O_2$ ; the Fe and Cu content of the fibers, the danger of such content and its detection analytically; and the slight importance of catalytic injury with wool.

742. MARSH, PAUL B., GREATHOUSE, GLENN A., BOLLENBACHER, KATHARINE, and BUTLER, MARY L. Copper soaps as rot-proofing agents on fabrics. *Ind. Eng. Chem.*, 36 (1944), pp. 176-181; *C.A.*, 38 (1944), 1121.

A comparison is made of the fungicidal activity of Cu naphthenate, Cu oleate, Cu "tallate," and Cu resinate. Cu naphthenate prevents rotting of cotton fabrics by mildew at a lower concentration than do the other compounds. This is due in part to the fact that naphthenic acid itself is a potent fungicide. Various factors which influence the rotting-preventative properties of the four Cu compounds are dis-

cussed. These include leaching, adsorption and chemical deactivation through hydrolysis and subsequent formation of insoluble Cu compounds in the soil. A comparison is made between the soil burial test for mildew and the laboratory tests using incubation with *Chaetomium globosum* and *Metarrhizium*. The effect of soil composition on the results of tests is studied by employing four types of soil with different chemical and mechanical properties.

743. MŌRI NOBORU 毛利登. Experiments on the preservation of ancient fabrics. *Sci. Pap. Japn. Antiques*, no. 3 (Jan. 1952), pp. 21–26.

Polyvinyl alcohol and acrylic resin were used for the preservation of old cloth, old papers, and the prevention of the loss of gold foil.

KY

744. MYERS, GEORGE HEWITT. Rugs: preservation, display and storage. *Workshop notes, Pap.* no. 5 (Je. 1952). 4 pp., pl.

Many practical suggestions are given for examination, washing, repair, display, and storage. In storage rugs should always be rolled against the pile, right side inward. They should be rolled on poles of well-seasoned wood three or more inches in diameter. Standard conditions are 70°F. and 65 percent relative humidity. They are most readily accessible if the poles are hung on skeleton rug racks built against the walls. Before annual building fumigation each rug is vacuumed back and forth, sprinkled with paradichlorobenzene flakes, approximately ½ lb. or two handfuls to a 4 x 6 rug, and then rolled on its pole. Storage fumigation is most effective at a temperature 90°–100°F. for 48 hours using 1 lb. paradichlorobenzene flakes per 10 cu. ft.

RJG

745. ŌGA ICHIRŌ 大賀一郎 "Taima Mandala" is a cloth woven like a tapestry. *Sci. Pap. Japn. Antiques*, no. 1 (Jan. 1951), pp. 4–11.

The "Taima Mandala," which represents the portraits of Buddha and his attendants, was found by microscopic examination, infrared and X-ray photographs to be a cloth woven like a tapestry.

KY

746. O'NEALE, LILA MORRIS. *Textiles of Pre-Columbian Chihuahua*. Washington, D. C., 1948. (Carnegie Institution of Washington. Publ. 574 [Contributions to American anthropology and history, v. 9, no. 45]), pp. 95–161, figs. 15–30, tables.

Contents: Preface; Foreword, by A. V. Kidder; The Chihuahua cloths; The fiber; Yarns; Colors; The loom; Loom procedures; Weaves and weaving procedures; Textures and thread counts; Stitchery techniques; Pattern; Abstracts of analytical descriptions; Summary; Appendix—Chemical notes on the coloring matter of Chihuahua textiles of Pre-Columbian Mexico, by Michael Kasha; Glossary; References.

BMU

747. POPE, ARTHUR UPHAM, and ACKERMAN, PHYLLIS. The most important textile ever found in Persia: a piece of two-faced silk serge

bearing the name of the weaver and the date—994 A.D. Technically it is in some respects the most remarkable piece of weaving found anywhere. *I.L.N.*, 202 (1943), pp. 48, 49, illus.

Each surface carries an entirely different pattern, woven simultaneously. The article gives a short account of the method of weaving used. MB

748. REICH, IRVING, and SNELL, FOSTER DEE. Preferential wetting of cotton fabrics. *Ind. Eng. Chem.*, 41 (1949), pp. 2797-2800.

A technique for measuring preferential wetting of a fabric at oil-water interface is described. The factors in fabric cleaning and the principles of detergency are discussed. RJG

749. SASAKI SHINZABURO 佐々木信三郎. *Nihon jōdai shokugi no kenkyū* 日本上代織技ノ研究. Researches on the technique of ancient Japanese textiles. Kyōto, Kawashima Orimono Kenkyū-jō, 1951. [162] pp., illus., pls. (part col.).

Contents: Examples of: (1) unfigured cloth, (2) patterned cloth (silk twill and gauze), (3) brocades, (4) brocaded twills.

Reviewed in: *Bijutsu shi*, 2 (1952), pp. 101-102, by Yamanobe Tomoyuki. HPS

750. SIPPEL, A. Prevention of damage to textiles by sunlight. *Textil-Praxis*, 7 (1952), pp. 220-223; *C.A.*, 46 (1952), 6392d.

The energy of light of the wavelengths under 3,600 Ångström units suffices to destroy the macromols of fibers photolytically; the energy of visible light will only destroy fibers in the presence of H<sub>2</sub>O and O or at high temps. With curtains the permeability of glass to ultraviolet light will be lowered by its Fe content. Under controlled conditions of exposure to light the following mathematical relationship is valid:  $F = F_0 \cdot 10^{-at}$  or  $\log F_0/F = at$ , where  $F$  is the tear resistance after exposure,  $t$  is time of light exposure,  $F$  is the tear resistance before exposure,  $a$  is a characteristic constant.  $Z$  is the time when  $F$  is  $F_0/20$ , when the fabrics will be practically useless. It is determined from  $Z = 1935 \log F_{s0}/F_s / \log F_0/F$  where  $F_{s0}$  is tear resistance of the standard before exposure,  $F_s$  is tear resistance after exposure, and 1935 is an empirical constant. For accurate measurements is used:  $\phi = F(1 - (D/100))$ . Where  $\phi$  is the tear resistance per square unit of broken surface, and  $D$  is the break extension in %. All tear experiments are conducted in the wet. If the lowering of the degree of polymerization of films is measured, the formula  $k = 1/t(1/p) - (1/p_0)$  will give the velocity constant,  $p_0$  is the degree of polymerization before light exposure,  $p$  the same at the time  $t$ , and  $t$  is the time of exposure. These tests conducted on different types of fibers showed that polyvinyl chloride and polyacrylonitrile will stand continued weathering conditions best. In thick rope nylon can also be used because ultraviolet rays cannot penetrate into the core of the rope and will only damage the outermost layer. Cellulose acetate is the

most light-resistance cellulose fiber (useful for curtain material). Small amounts of Fe in the fiber will catalyze decomposition by light. This can be counteracted by  $H_3PO_4$ .  $TiO_2$ , which is used as a matting agent and causes destruction of the fibers by light, may be counteracted with Mn salts. Polyvinyl chloride fibers are light-stabilized with amines or metal compounds.

751. SIU, RALPH. Microbial decomposition of cellulose with special reference to cotton textiles. New York, Reinhold Publishing Corp., 1951. 531 pp., illus.

Contents: A, Cellulose decomposition in nature; B, Morphological, physical, and chemical features of cotton; Structural features of cotton fabrics; C, Causal organisms; D, Mechanism of degradation; E, Methods of prevention; Index of microorganisms; Subject index. RLF

752. SYLWAN, VIVI. *Investigation of silk from Edsen-gol and Lop-nor and a survey of wool and vegetable materials*. Stockholm, 1949. (Reports from the Scientific expedition to the Northwestern provinces of China under the leadership of Dr. Sven Hedin. Pub. 32. VII. Archaeology 6) x, 180 pp. pls. (part col.).

Contents: Coloring, dyes and dyeing, pp. 156-160; Weaving, looms, and methods, pp. 164-168; Cleaning of silks and articles of silk, pp. 175-176. BMU

753. Textile institute, Manchester, Eng. *The identification of textile materials*. Manchester, Eng., The Institute, 1949. (Handbook of textile technology, no. 3) 10 pp. plates, fold. table.

Contents: Introduction; Manufactured fibres; Chemical properties; Physical properties; Method of cutting cross sections; Photographs of animal fibres; Density gradient tube; Photomicrographs.

Reviewed in: *Analytical Chemistry* 24 (1952), p. 1072; *Conservation*, 1, no. 3 (1952/54), pp. 143-144, by F. I. G. Rawlins. BMU

754. TOUCEDA, ELENA. Procedures for cleaning cotton textiles. *Workshop notes, Pap.*, no. 4 (1951), 5 pp.

The procedures include: 1, Microscopic analysis; 2, testing the colors; 3, Cleaning; 4, Blocking. A list of necessary supplies is given. RJG

755. TOWNSEND, GERTRUDE. Two fragments of late Hellenistic tapestry. *B.M.F.A.*, 46, no. 263 (1948), pp. 12-17.

Two small fragmentary pieces, tentatively attributed to the fifth century A.D. and probably woven somewhere in the eastern Mediterranean area, are both fine tapestry, about 15 warps to the centimeter, with designs woven in gold thread and a little color against a background of deep neutral purple. The warp of the smaller piece is linen, the weft gold thread, wool, and a little silk, while the warp of the larger piece is wool, the weft gold thread and wool. The gold thread



appears to be a natural alloy of gold with approximately 5 percent silver and 1 percent copper, wound directly on a silk core. The analysis is made with reservations since difficulties were encountered during examination of the tiny specimens available. The subjects, use, and technique are discussed and the fragments described. EHJ

756. TRUDEL, VERENA. Textilkonservierung. *Z. Schweiz. Arch. Kunst.*, 12 (1951), pp. 227-230, 4 illus.

Généralités sur l'examen, la conservation, la restauration et l'exposition des textiles. Les techniques utilisées au Musée National de Zurich. PC

757. VON BERGEN, WERNER, and KRAUS, WALTER. *Textile fiber atlas; a collection of photomicrographs of old and new textile fibers*. rev. ed. New York, Textile book publishers, inc., c1949. 50 pp., 27 numb. pls.

Contents: Preface; Natural animal fibers—Wool—Specialty hair fibers—Minor hair fibers—Fur fibers—Silk; Natural vegetable fibers—Cotton and minor seed hairs—Bast fibers—Structural fibers; Rayon fibers—Filament and staple rayons; Protein and synthetic fibers; Mineral fibers (Asbestos and glass); Bibliography. BMU

#### K. ANIMAL PRODUCTS (LEATHER, SKINS, PARCHMENT, AND IVORY)

758. BARGHOORN, E. S. Histological study of the action of fungi on leather. *J. Amer. Leather Chem. Assoc.*, 45 (1950), pp. 688-700.

Leather samples representing three standard methods of tanning were studied histologically for evidence of fungus attack on the collagen. Vegetable tanned leathers supported more vigorous growth of mycelium than chrome tanned leathers. Examination of thin microtome sections failed to reveal evidence of attack on the collagen fibers of the leather, although a minor invasion of fungus hyphae may be observed in hair follicles and in the larger interstitial spaces between collagen aggregates. The vigorous development of mildew on fresh leather is at the expense of substances incorporated in the leather during tanning and subsequent treatment, not at the expense of the collagen matrix of the hide. The behavior of mold-infected leather is not comparable to that of infected wood, cotton fabrics, or other cellulosic material. RJG

759. CAMMANN, SCHUYLER. The story of hornbill ivory. *Penn. Univ. Mus. Bull.*, 15 (1950), pp. 19-47, illus.

Hornbill ivory is derived from the solid casque or epithema above the beak of the helmeted hornbill (*Rhinoplax vigil*), a large arboreal

bird which inhabits Southeast Asia, Borneo, and adjacent islands. The solid ivorylike substance which forms the bulk of the casque is covered at top and sides—but not in front—by a sturdy and gleaming sheath of brilliant red, which also overlaps the skull proper. This substance has long been prized by the Chinese as a medium for small carvings as buckles, snuff bottles, and thumb rings and by the natives of Borneo for earrings, ear plugs, and other ornaments. Not until the Ming Dynasty does it definitely figure in the Chinese records. The material is called by the Chinese *ho-ting* 鶴頂, by the Japanese *hoden* ホウデン. Hornbill ivory is yellow and somewhat less dense than elephant ivory. Frequently the red layer is worked into the design. Canton was formerly the center for working and distributing hornbill ivory, but only in Borneo does the work on this substance continue.

RJB

760. CONDON, EDWARD UHLER. *Preservation of the Declaration of Independence and the Constitution of the United States*. Washington [U. S. Govt. print. off.] 1951. (National bureau of standards. Circular 505.) 16 pp.

By using facsimiles of the original documents, which are inscribed on animal parchment, a method of procedure was worked out which embodied (1) a double laminated plate glass enclosure separated by a bronze frame and a Pb strip to which the glass is hermetically sealed with solder; (2) evacuation of the air from the document space and its replacement by pure helium gas with sufficient water vapor to give an r.h. of 25–35 at r.t.; (3) backing the document within the enclosure with pure cellulose all-rag paper; (4) incorporating within the frame detectors made of 0.001 inch-diam. platinum thermal conductivity cells; (5) exposing the enclosed documents under a laminated glass filter using yellow cellulose acetate sheet middle layer. The report is well illustrated. Data are given in respect to the effects of radiant energy on cellulose and the protective action of light filters.

RJB

761. KANAGY, JOSEPH R., CHARLES, ORBELIA M., ABRAMS, EDWARD, and TENER, REES F. Effects of mildew on vegetable-tanned strap leather. *J. Res. Nat. Bur. Stand.*, 36 (1946), pp. 441–454.

Physical tests show loss of tensile strength, decreased stretch at breaking point and weakened grain surface. Decomposition of grease by molds appeared to be principal cause for change in physical properties. No appreciable deterioration of hide substance was indicated. A fungicidal oil containing paranitrophenol and pentachlorophenol resisted the growth of mildew under the test conditions.

RLF

762. KANAGY, JOSEPH R. Influence of temperature on the adsorption of water vapor by collagen and leather, *J. Res. Nat. Bur. Stand.*, 44 (1950), pp. 31–45.

Studies ranged from 0–96 percent relative humidity at 28°, 50° and 70°C. Collagen, hide powder, and four leathers investigated.

RLF

763. KRITZINGER, C. C. Preservation of skins for museum purposes. *SAMAB* 3 (1945), pp. 351-352; *C.A.*, 40 (1946), 3287.

Both bacterial decay and insect damage to hides and skins can be prevented or stopped by dipping them, when freshly flayed, for 15 to 30 minutes in a one percent solution of  $\text{Na}_2\text{SiF}_6$ . After this treatment any recognized method of curing can be adopted. As  $\text{Na}_2\text{SiF}_6$  is not a fungicide, organic mercurial compounds or some other suitable compounds should be used to eliminate fungi.

764. MALLOWAN, M. E. L. Ivories of unsurpassed magnificence—the finest and largest from the ancient Near East discovered in this season's excavations at Nimrud. *I.L.N.*, 221 (1952), pp. 254-256.

This paper contains Dr. H. J. Plenderleith's technical report on the cleaning of one of these ivories. MB

765. PLENDERLEITH, HAROLD J., and MOSS, A. A. Comment on "An improved leather dressing"; a reply to the article by Messrs. Unwin & Middleton in the June issue. *M.J.*, 51 (1951), pp. 128-129.

The 'Unwin leather dressing' has incompatible components and the proportion of beeswax to lanolin is so great that it is a polish rather than a dressing and certainly not to be recommended. IG

766. PLENDERLEITH, HAROLD JAMES. *The preservation of leather book-bindings*. London, British museum, 1946. 24 pp., illus.

Contents: Library problems—The seemingly haphazard deterioration of modern leathers; Scientific investigation—Causes and prevention of decay; The P.I.R.A. test for durable leather; The time test; Limited usefulness of leather dressings; Characteristics of protected leather—Cleaning leather bindings whether protected or unprotected; Can protected leather bindings be protected? Vellum bindings; Summary.

Reviewed in: *Bulletin des musées royaux d'art et d'histoire (Bruxelles)* Jan.-Dec. 1946, pp. 85-86. RJG

767. ROSE, C. D., and TURNER, J. N. Mold growth on leather as affected by humidity changes. *J. Soc. Leather Trades' Chemists*, 35 (1951), pp. 37-42; *C.A.*, 45 (1951), 8283d.

Two sets of samples from the butt area of a vegetable-tanned ox-hide were kept at relative humidities (R.H.) of 74 to 98 percent for 10 months at 25°. The A samples were previously dried over concentrated  $\text{H}_2\text{SO}_4$  for 77 days, while the B samples were wet with water just before being placed in the controlled atm. Controls for each series were treated with sufficient *p*-nitrophenol to prevent mold growth during the test. The A samples showed no mold growth up to 86% R.H. at which point the water regain value was 12%. All the B samples showed mold growth including those at 74% R.H., whose  $\text{H}_2\text{O}$  content was 13%. The controlling factor for mold growth is, therefore, the moisture content and not the R.H. of the

surrounding area. In this particular case a moisture content higher than 12% is necessary for mold growth within the R.H. studied. It seems probable that  $H_2O$  in excess of that thought to be chemically and molecularly bound by the leather must be present in order to support mold growth.

768. STEINER, EDWARD T., and HOSTERMAN, ELIZABETH R. Aging of karakul and seal fur skins, *J. Res. Nat. Bur. Stand.*, 45 (1950), pp. 317-322.

Physical and chemical data on deterioration of skins. RLF

769. UNWIN, MAX, and MIDDLETON, BERNARD C. An improved leather dressing. *M.J.*, 51 (1951), pp. 69-70. IG

770. WATERER, JOHN WILLIAM. *Leather and craftsmanship*. London, Faber and Faber limited, 1950. xii, 66 pp., 32 numb. pls.

Contents: Foreword, by Gordon Russell; Prehistory to Renaissance; Renaissance to industrial revolution; Industrial revolution to the present day; Craftsmanship and leather; Leather in literature. BMU

## L. PAINTS, PIGMENTS, DYES, AND INKS

### 1. PAINTS

771. BLOM, AXEL VIGGO. *Organic coatings in theory and practice*. New York, Elsevier pub. co., 1949. 300 pp., illus. (Elsevier's polymer series, 6.)

Contents: Preface; Fundamental considerations; Film-forming materials from natural sources; Synthetic film-forming materials; Physical film formation; Chemical film formation; Pigments; Coating film properties and their testing; Selected bibliography; Author index; Subject index.

Reviewed in: *Chem. Eng. News*, 27 (1949), p. 3144, by A. C. Elm.  
BMU

772. BUC, G. L., KIENLE, R. H., MELSHEIMER, L. A., and STEARNS, E. I. Phenomenon of bronze in surface coatings. *Ind. Eng. Chem.*, 39 (1947), pp. 147-154; *C.A.*, 41 (1947), 2589.

A review dealing with interface and interference bronze in paints and inks. Development of formulas for calcn. of both types of bronze



is traced. Color effects described in the article are illustrated with 24 colored photographs. 19 references.

773. BUNKER, H. J. Moulds and bacteria in paint, from the point of view of a microbiologist. *J. Oil Col.*, 29 (1946), pp. 201-210.

Factors governing the development of micro-organisms whether fungi or bacteria are discussed. Of particular interest is the production of hydrogen sulphide by certain anaerobes, and its action on pigments. SRJ

774. DRISCOLL, W. Paint and its examination in the Crime Laboratory of the Federal Bureau of Investigation, Washington. *Off. Dig.*, no. 211 (1941), pp. 575-582; *Review*, 16 (1943), p. 51.

The technique used in proving the identity of two paint scrapings is described. The number, color, and thickness of the different coats are determined under the microscope and the elements present are identified and estimated spectrographically.

775. DUNBAR, R. E. Chemical changes in films with aging. *Off. Dig.*, no. 323 (1951), pp. 857-860; *C.A.*, 46 (1952), 9863b-f.

A study was made of 23 clear and 23 pigmented paint films, stored under a variety of conditions over a period of several months for changes in acid and saponification numbers. Each of the 23 pigmented films was also exposed in a Weatherometer for several months and was checked for pigment loss due to chalking. The pigment, in the pigmented materials, consisted of 75 percent rutile  $\text{TiO}_2$  and 25 percent  $\text{ZnO}$  by weight. Four glass plates were covered with each paint and they were then held for one week at 50 percent relative humidity, 77°F., and constant illumination with a 15-watt daylight fluorescent lamp. The plates were then transferred, one each, to four aging cabinets of 50 percent relative humidity with no light; 50 percent relative humidity and 25 foot-candle daylight fluorescent light; 100 percent relative humidity and 25 foot-candle daylight fluorescent light; and 100 percent relative humidity with Hg-arc light, and all at 77°F. Each film was then sampled for acid and saponification numbers at the end of 1, 4, 7, 10, and 12 weeks. For the chalking tendencies of the 23 pigmented oils, films were cast on glass plates, dried for one week at 77° and 50 percent relative humidity and 25 foot-candle daylight fluorescent light. The films were then transferred to a Weatherometer. At two-week intervals the plates were washed with  $\text{H}_2\text{O}$  and the washings analyzed for  $\text{TiO}_2$  and  $\text{ZnO}$ . This procedure was followed for 16 weeks or until the breakdown of the film. The paint pigments formulated provided almost complete protection for the vehicle from ultraviolet light. The acid values of the pigmented oils did not show the sharp increases exhibited by the clear oils. The breakdown of the varnish films was ordinarily attended by an increase in the acid value. There was evidence that paints and varnishes tend to yellow in darkness and this may not be due ex-

clusively to linolenic acid and its esters. High humidity did not tend to hydrolyze the vehicles of the alkyd resins. Dipentaerythritol esters appeared to be somewhat more easily hydrolyzed than those of pentaerythritol. The alkyd resin vehicles showed remarkable resistance to the chalking of pigment. ZnO leached freely from the non-alkyds.

776. EICKHOFF, ARNOLD J., and HUNTER, RICHARD SEWALL. Measurement of the fading of paints, I-II. *Paint Oil Chem. Rev.* R.P. 1478 in *J. Res. Nat. Bur. Standards*, 28 (Je. 1942), pp. 773-793; *Paint Oil Chem. Rev.*, 104 (1942): no. 13, pp. 9-11, no. 14, pp. 6-8; *C.A.*, 36 (1942), 6815.

Improved methods for measuring the course of fading of paints are in demand. Two of the important evidences of the fading of paints, namely change of color and change of gloss, can be measured rapidly by photoelectric methods developed within the past few years. Photoelectric tristimulus measurements of color change and photoelectric measurements of specular-gloss change were used to follow the fading of several paint samples exposed both to outdoor weather and to two machine treatments A and B designed to weather the samples at an accelerated rate. With these measurements it was possible to compare numerically the rates of artificial and natural fading of the paints. For outdoor exposure, the panels were placed in racks facing south at 45° from horizontal on the top of a building at the National Bureau of Standards, Washington, D. C. Each accelerated weathering apparatus used a C-arc as a source of radiant energy and an H<sub>2</sub>O spray which wet the panels at regular intervals. Operating schedules were arranged which allowed time for inspection and measurement of the panels as well as time for their rest during each week. During the 168 hrs. of a week, the panels in apparatus A were subjected to irradiation and intermittent wetting for 81.5 hrs., those in apparatus B for 106.5 hours. In computing the lengths of exposure only the periods of actual operation of the apparatus were used. The results show: (1) the treatment in apparatus A caused fading which averaged 20 times as fast as fading outdoors, but the speed-up factor varied from roughly 5 times for one paint to roughly 40 times for another; (2) the treatment in apparatus B caused fading which averaged 5 times as fast as fading outdoors, but the speed-up factor varied from roughly 3 times for one paint to roughly 20 times for another; and (3) for almost every paint tested, the factor relating the speed of fading from treatment in apparatus A to the speed outdoors was more nearly constant through the whole fading process than the corresponding factor for treatment in apparatus B. Thus treatment A not only faded paints faster, but it provided a preview of the course of fading which was usually a better representation of outdoor fading than that provided by treatment B. The paint finishes tested were chrome yellow and zinc oxide in linseed oil, white lead and zinc oxide in linseed oil tinted with Para Red, and 6 oleoresinous enamels.

777. FINDLAY, W. P. K. Discoloration of paint caused by mold growth and its prevention. *J. Oil Col.*, 23 (1940), pp. 217-232; *C.A.*, 35 (1941), 4226.

The influence of the various components of oil paints, the substrate, and various fungicides on mold growth is discussed. For most situations an antiseptic, e.g., thymol, which prevents infection during drying and hardening of the films suffices, but under dirty, damp conditions more lasting protection with, e.g., mercury compounds, is required. Methods of testing fungicides and the treatment of discolored films are also described.

778. GARDNER, HENRY A., and SWARD, G. G. *Physical and chemical examination of paints, varnishes, lacquers and colors*. 11th ed. Bethesda, Md., Henry A. Gardner laboratory, 1950. 653 pp., illus. (part col.).

Contents: Hiding power; Examination of colors for tone and strength; Light reflection; Color; Color standards for liquids; Gloss; Ultraviolet light; Temperature and humidity control; Preparation and thickness of films; Drying time of films; Hardness, abrasion, impact, adhesion; Exposure tests; Accelerated weathering; Particle size and texture of pigments; Surface tension and interfacial tension; Oil absorption; Consistency; Miscellaneous testing devices and methods; Specific gravity; Examination of drying oils and oil seeds; Examination of driers and metallic soaps; Examination of volatile thinners; Examination of resins; Examination of shellac; Examination of varnishes; Examination of bituminous paints; Examination of waxes and polishes; Analysis of paint; Testing raw materials for cellulosic coatings; Physical tests on cellulosic coatings; Analysis of cellulosic coatings; Specifications; Agricultural tests on oils; Index.

Reviewed in: *Chem. Eng. News*, 124 (1946), p. 2288, *Lib. J.*, 71 (Oct. 1, 1946), p. 1322, by L. A. Eales; *Verfkroniek* (1950), p. 141. RJG

779. GOURLAY, J. S. The strain-energy relations of some colloidal films. *J. Oil Col.*, 29 (1946), pp. 94-102.

An examination of the development of strain in colloidal films on drying. The surface is compared to a stretched membrane which Raleigh treated mathematically. The role of plasticizers, temperature, and moisture is discussed. SRJ

780. HESS, MANFRED. *Paint film defects; their causes and cures*. New York, Rheinhold pub. co., 1951. xvii, 543 pp., pls. Translation of "Häufige Anstrichmängel und Anstrichschäden," 1938.

Contents: Faults which develop during storage; Faults developed during application; Failures developing shortly after application; Defects of coatings on the finished objects when in use; Postscript; Bibliography; Indexes.

Reviewed in: *Chem. Eng. News*, 29 (1951), by G. G. Sward; *Conservation*, 1 (Oct. 1952), p. 46, by A. E. Werner. BMU

781. HINTZE, OTTO E. The permeability of lacquer films. *Farben, Lacke, Anstrichstoffe*, 3 (1949), pp. 265-270, 291-300; *C.A.*, 44 (1950), 851g.

The relative moisture permeability (R.M.P.) (i.e. water vapor losses through films/free evaporation of water under test conditions) was determined of clear and of pigmented films of Plexigum B50 lacquer, linseed-oil varnish, linseed-oil stand oil (0.1 percent Co.), China-wood-oil stand oil, nitrocellulose lacquer (containing Resin AW2, Palatinol C, and tritoyl phosphate), chlorinated rubber (Pergut N) plasticized with Clophen A60, and of a bitumen. R.M.P. was only affected by temperature changes. Various methods of determining moisture permeability (American cup, Demmler jars, Rossmann cup) are discussed. The R.M.P. of free films and in the open air was lower than that of supported films (on parchment paper), and inside a desiccator. The R.M.P. changed little with pigmentation until the pigment content (e.g. coke black, gas black, Fe oxide red) was quite high. However, film swelling indicated over-pigmentation began at 30-50 percent pigment. The R.M.P. was lowest with bitumen, chlororubber, and nitrocellulose, highest with linseed-oil varnish, and intermediate with the stand oils. Even though pigments did not lower the R.M.P., films containing them beyond certain low concentration showed much reduced rust-inhibiting action for steel and lowered anticorrosive action for Elektron metal (tested by salt or by water spray). The effect of pigments in various concentrations is shown in detail. The nature of film permeability is discussed.

782. LEONARD, JOHN M., and PITMAN, A. L. Tropical performance of fungicidal coatings; a statistical analysis. *Ind. Eng. Chem.*, 43 (1951), pp. 2338-2341, tables.

Tests were carried out in a Panama jungle on nearly 100 toxic agents in one, five, and ten percent concentrations (a) in a clear phenolic tung oil varnish and (b) on alkyd-resin-modified nitrocellulose lacquer. Most of the toxicants studied, including many of the popular chlorinated phenols, were ineffective. The best in approximate descending order of effectiveness were: *o*-Hydroxyphenylmercuric chloride; Salicylanilide; Pyridylmercuric chloride; *p*-Toluene sulfonylamide; Uranyl nitrate; *p*-Aminophenylmercuric acetate; Phenylmercuric-*o*-benzoic sulfimide; *p*-Acetylaminophenylmercuric acetate; Hydroxymercurisalicyclic acid anhydride; Phenylmercuric phthalate. Each of the primary variables (vehicle, fungicide, concentration, and time) has a significant influence on mold growth. The choice of an individual toxicant (from among the best ten) is of less importance than the choice of vehicle. Retardation of mold varies directly with concentration of toxic agent. Concentration is the most important of the four variables.

RJG

783. LONG, J. S. Film formation, film properties, film deterioration. *Off. Dig.*, 255 (1946), pp. 150-162; *J. Oil Col.*, 32 (1949), pp. 377-445; *Abstract Review*, no. 153 (1950), p. 16.



The formation of films, their aging, and their deterioration are reviewed in detail, with extensive literature references. The lack of information on mechanical properties of paint films is pointed out and the importance of such information in predicting the ultimate life of the film is emphasized. Exterior film deterioration is brought about largely by ultraviolet light, moisture, and temperature changes. Each of these should be studied separately, so that the relative importance of each may be weighed. Data on moisture absorption and ultraviolet transmission of films are presented, both correlating well with known durability characteristics. The Federation Research Project on pure compounds is outlined, and the preparation of certain pentaerythritol esters and alkyds is described in detail. Some preliminary results on oxygen absorption, acetone solubility, and infrared transmission are given. 995 references.

784. MATTIELLO, JOSEPH J., editor. *Protective and decorative coatings: paints, varnishes, lacquers, and inks*. Prepared by a staff of specialists under the editorship of Joseph J. Mattiello. New York, J. Wiley & Sons, inc.; London, Chapman & Hall, limited, 1941-46. 5 v. illus., tables, diagrs. References at end of most of the chapters.

Contents: I. Raw materials for varnishes and vehicles. (Reviewed in: *Ind. Eng. Chem. News Ed.*, 19 (1941), p. 1370); II. Raw materials: pigments, metallic powders, and metallic soaps. (Reviewed in: *Amer. Paint Jour.*, 26 (1942), p. 66; III. Manufacture and uses: colloids, oleoresinous vehicles and paints, water and emulsion paints, lacquers, printing inks, luminescent paints, and stains. IV. Special studies: Wetting; grinding; color; etc. V. Analysis and testing methods. (Reviewed in: *Ind. Eng. Chem., Anal. Ed.*, 18 (1946), p. 730).  
BMU

785. MEIER, K., and SCHMIDT, H. Fungus growth on coatings. *Dtsch. Farben-Z.*, 6 (1952), pp. 87-92; *C.A.*, 46 (1952), 6400d-h.

The varieties of fungi on coatings are reviewed. Four varieties, obtained by transferring fungus scrapings from painted exterior surfaces to linoxyn (14 days old) and allowing them to grow four weeks (when they covered 50 sq. cm.), were further cultivated on various media. They were an ascomycete (*Penicillium*, green) and three fungi imperfecti (*Dermatium*, black; *Monoverticillium*, yellow; and an unidentified fungus (I), white). The rapidly growing I was selected for study. Pin-point samples of I transferred to 5 x 5 cm. glass panels covered with films (10 $\mu$  thickness) of various vehicles and placed in moistened Petri dishes, were studied for linear-growth rate for 48 days. The vehicles and the rate of growth of I on them were: dextrin, 2.90; phenolic resin, 2.90; modified phenolic resin (Albertol 347 Q), 1.90; oil-modified alkyd (Alftalat 423D), 1.90; Me cellulose, 1.70; nitrocellulose, 1.70; lacquer linseed oil, 1.20; raw linseed oil, 1.20; cellulose acetate, 0.97; Gilsonite asphalt, 0.97; plasticized urea-CH<sub>2</sub>O resin (Resamin 316F), 0.97; linseed oil standoil, 0.73; oiticica oil,

0.65; polyvinyl acetate, 0.65; chlorinated rubber, 0.65; chinawood oil, 0.62; poppyseed oil, 0.34; Coumarone resin, 0.84; colophony, 0.31; damar, 0.27; shellac, 0.00. The growth progressed steadily at a uniform rate. The effect of pigments (2 percent in lacquer linseed oil) on the growth rate of **I** was studied next: Cr oxide green, 1.07; chalk, 0.83; barytes, 0.63; Mn black, 0.50; white lead, 0.50; Fe oxide red, 0.43; Bremen blue, 0.43; chrome yellow, 0.40; Scheele green, 0.33; Lenzin, 1.23; lampblack, 0.23; Naples yellow, 0.23, Cd yellow, Zn white, ZnS,  $\text{Pb}_3\text{O}_4$ , cinnabar, 0.20; Paris blue, 0.17;  $\text{TiO}_2$ , 0.07. A linoxyn film on which fungus had grown for two months became softer, less adhesive, and less elastic, much more (10 times) soluble in alkalis, and much more easily (70 times) swelled by water. Addition of fungicidal materials (0.2 percent) to lacquer linseed oil failed to stop the growth of **I** as shown by the growth rates: Na silicofluoride, 0.27;  $\text{ZnCl}_2$ , 0.43; benzoic acid, 0.50; salicylic acid, 1.00; *p*-chlorobenzoic acid, 0.27; phenol, 0.40 percent; the growth rate was not changed substantially by using 2 percent of these materials except with *p*-chlorobenzoic acid (0.17 percent).

786. PARTANSKY, ALEXANDER M. Field testing of mold-resistant properties of interior oil paints. *Ind. Eng. Chem., Anal. Ed.*, 14 (1942), pp. 527-531; *C.A.*, 36 (1942), 5362.

Organic matter, vapors, and dust are conducive to mold growth but interfere somewhat with the testing of the mold-resistant properties of paints. Mold resistance of interior paints should be tested by applying the test paints to carefully selected sections of walls and ceiling on which water condensation is continuously taking place and which are found to be the most heavily contaminated area on the plan selected. The use of wooden panels may give erroneous results owing to the difference in conditions between them and the painted surfaces of the building. Without an adequate preservative, the paint with a cold-cut resin type of vehicle molded as readily as the paint with a vegetable-oil type of vehicle. Tetrachlorophenol and Zn tetrachlorophenate were found to be the most effective paint preservatives among those tested. Under extremely severe conditions, 3 percent tetrachlorophenol and 3 percent Zn tetrachlorophenate preserved both an oil and a cold-cut resin type of interior paint for two years. The field test confirmed earlier conclusions on the relative effectiveness of fungicides in oil paint as determined by the rapid laboratory method. Fourteen references.

787. PAYNE, HENRY FLEMING. The dip coater; an instrument for making uniform films by the dip method. *Ind. Eng. Chem., Anal. Ed.*, 15 (1943), pp. 48-56; *C.A.*, 37 (1943), 1064.

An instrument is described by means of which coatings of uniform thickness can be laid on steel panels with different types of varnishes, paints or enamels. Coatings of various thicknesses over the normal useful range can be made by varying the rate of withdrawal or the viscosity of the coating or both. For a given withdrawal rate the film thickness depends more upon the viscosity than upon the solid content.

788. PAYNE, HENRY FLEMING. Fundamentals of film formation. *Off. Dig.*, no. 325, pt. 1 (Feb. 1952), pp. 81-97, diagsr.

Lecture. Review with diagrams on the mechanism of film formation from natural and synthetic products. It covers chemical composition, functionality of the film former, and the type and degree of polymerization. RJG

789. POTTER, P. W. Early use of paint in the American colonies. *Amer. Paint J.*, 35, no. 8 (1950), pp. 74, 76, 78; *Abstract Review*, no. 164 (1951), p. 3.

A short account of the use of paint by the Indians and the early colonies.

790. ROCHOW, T. G., and STAFFORD, R. W. Coatings. *Anal. Chem.*, 22 (1950), pp. 206-210.

This first paper of the "Second Annual Review of Analytical Chemistry" reviews all the papers published mainly in 1949, on the analysis of organic coatings. Annotated bibliography with 105 references. RJG

791. SALVIN, S. B. Influence of zinc oxide on paint molds. *Ind. Eng. Chem.*, 36 (1944), pp. 336-340; *C.A.*, 38 (1944), 2835.

Raw linseed oil is an excellent medium for the growth of paint molds, six other oils tested varying in fungistatic influence. Fine, specially prepared zinc oxide was the most fungistatic of the zinc oxide pigments tested. Fungistatic power is inversely proportional to zinc oxide particle size. Zinc oxide should not be termed a fungicide. Heavy metal ions, including  $Zn^{++}$ , inhibit respiration of fungi.

792. STERN, E. Swelling of protective films. *Paint Mfg.*, 12 (1942), pp. 178-180, 181; *C.A.*, 37 (1943), 540.

An illustrated discussion of the micrography of paint films. Swelling, or imbibition, is a process due to the absorption of a liquid, especially water, by a homogeneous solid without apparently affecting its homogeneous character. It is considered as the formation of a solid solution of water or other solvents, though valence forces may play a part. Sixteen references.

793. STEWART, JEFFRY R., HICKSON, EUGENE F., and SEYMOUR, RAYMOND B. *National paint dictionary*. 3d ed. Washington, D. C., Stewart research laboratory, 1948. 704 pp., 200 illus., tables.

Contents: Foreword, by Henry A. Gardner; Preface; Acknowledgment; Dictionary; Supplement; Index to Supplement; Index to advertizers.

Reviewed in: *J. Amer. Oil Chem. Soc.*, 24 (1947), p. 42. BMU

794. WULF, HEINRICH. *Farbwarenkunde*. Oldenburg, Müller, 1950. 304 pp., illus., color charts.

Inhaltsverzeichnis: Allgemeines; Prüfung der Werkstoffe; Farbkörper; Bindemittel; Lackrohstoffe; Verdünnungsmittel; Trockenmittel; Hilfsmittel; Malmaterialien; Werkzeuge; Gesetzliche Vorschriften; Verzeichnisse. BMU

795. WURTH, K. Bleaching of blackened white lead paints. *Farben-Ztg.*, 46 (1941), p. 727; *C.A.*, 37 (1943), 2593; *Abstract Review*, no. 83 (1943), p. 115.

In the blackening of white-lead house paints by waste gases, spots form especially in moist places. In many cases the blackening disappears after a time, but not evenly. The bleaching takes place through change of  $PbS$  into  $PbSO_4$ , the oxidation process being accelerated by moisture and accompanying  $H_2O_2$ .

## 2. PIGMENTS

796. ABBOTT, R. A., and STEARNS, E. I. Identification of organic pigments. *Amer. Ink Maker*, 21, no. 12 (1943), pp. 27-30; *Abstract Review*, no. 90 (1944), p. 66.

Most of the organic pigments used in the printing-ink industry are reds. These present a problem in identification. Identification may be made by chemical methods or by study of the spectrophotometric curve shape. This latter method is illustrated with the following pigments: Bromo Toner, Rhodamine BX Lake, Naphthosol, Toluidine Red, Lithol Red, Lake Red C, Para Red, Permaton Orange and Lithol Rubine. Media used are pyridine, orthodichlorobenzene, sulfuric acid, and zinc oxide pull down. Four classes of curves are distinguished. Discriminatory tests are employed within the classes. Spectrophotometric curve ordinates are chosen so as to give curve shapes independent of concentration. Pigment mixtures or minor differences do not invalidate identification. The spectrophotometric method is rapid and requires only very small samples.

797. AREND, A. G. Cadmium yellow. *Paint Tech.*, 8 (1943), pp. 91-100; *Review*, 17 (1944), 1.

The manufacture of  $CdS$  and  $CdSe$  pigments, and the effect of variation of techniques on their color, are briefly described.

798. AUGUSTI, SELIM. *Alterazioni delle composizione chimica dei colori nei dipinti murali*. Napoli, Miccoli, 1949. 30 pp.

Altération des pigments minéraux observée à des peintures murales anciennes (Simone Martini, Zingaro, Paolo Uccello, Signorelli, Cimabue, Giotto). Cause et allure du phénomène d'altération: transforma-



tion de l'azurite en malachite, du noircissement de l'azurite et du blanc de plomb, du jaunissement de la terre verte et de plusieurs pigments à base de fer. JT

799. AUGUSTI, SELIM. *Colori antichi e colori moderni*. Napoli, 1948. 54 pp.

Couleurs d'origine végétale et animale, laques, couleurs provenant de la carbonisation de substances végétales et animales, couleurs minérales: obtention ou fabrication, emploi en peinture. JT

800. AUGUSTI, SELIM. Differenziazione e riconoscimento microchimico dei colori minerali. *Ind. Vernice*, 27 (juillet 1949), 10 pp. Also abstracted in: *C.A.*, 44 (1950), 9693*b*; *Brit. Abs.* (1950), C 178; *Abstract Review*, no. 161 (1950), p. 176.

Description, identification et différenciation microchimique des principaux pigments minéraux utilisés en peinture. JT

801. AUGUSTI, SELIM. Imitazioni e falsificazioni dei colori presso gli antichi. *Ind. Vernice*, 25 (1949), 11 pp.

Dans l'antiquité le commerce imitait (falsifiait) déjà des couleurs plus chères. Références à Pline, Vitruve et Dioscoride. Liste de ces couleurs et de leurs imitations. PC

802. AUGUSTI, SELIM. Ricerca microchimica degli anioni nei colori minerali prelevati dai dipinti. *Ind. Vernice*, 31 (novembre 1949), 4 pp.; Also abstracted in: *C.A.*, 44 (1950), 9694*i*.

Identification microchimique des anions caractéristiques des pigments minéraux utilisés en peinture. JT

803. AUGUSTI, SELIM. Ricerca microchimica dei cationi per la identificazione dei colori minerali nei dipinti. *Ind. Vernice*, 29 (septembre 1949), 11 pp., 13 illus. Also abstracted in: *C.A.*, 44 (1950), 9695*a*.

Identification microchimique, des cations caractéristiques des pigments minéraux utilisés en peinture. JT

804. AUGUSTI, SELIM. Ricerche sui colori di alcuni affreschi della chiesa superiore di S. Francesco in Assisi. *Boll. soc. natr. Napoli*, 55 (1944-45), pp. 24-26.

Identification des pigments de fresques de Cimabue, Giotto et Torriti. JT

805. AUGUSTI, SELIM. A yellow color (lake) uncovered at Pompei. *Ind. Vernice*, 4 (1950), pp. 109-112; *C.A.*, 44 (1950), 10344; *Abstract Review*, no. 168 (1951), p. 97.

A brownish-yellow, amorphous, brittle color found in a Pompei paint store (bright yellow with orange cast when powdered) gave off terpenic camphorlike vapors on ashing, and its ash contained

calcium, carbon dioxide, a little silicon dioxide, aluminum, and magnesium. With soda-lime, it distilled off terpenic (camphor) and balsamic vapors, yielding an orange-red, resinous sublimate. Tests with various acids gave bright yellow solutions while alkali yielded reddish-brown solutions. The organic matter is soluble in alcohol, acetic acid, methyl alcohol, acetone, and aniline, poorly soluble or insoluble in other solvents. It dyes wool from alkaline solution, but not cotton. According to a recipe of Marcus Vitruvius Pollionis (*De Architectura*, Liber VII, 14) it was shown that a yellow material similar to the Pompei material resulted when dried violets were boiled down in water until the violet color turned first green, then yellow, strained through cloth, the filtrate was mixed with limestone, and taken to dryness.

806. AZAM, M. A. Oil absorption of pigments. *Ind. Eng. Chem., Anal. Ed.*, 14 (1942), pp. 545-546; *Paint Mfg.*, 12 (1942), pp. 100-101, 108; *C.A.*, 36 (1942), 5363.

A long series of tests leads to the conclusion that the end point of the process of complete wetting of the pigment may be determined as the condition in which the paste sticks to the palette knife with very little effort. This point marks the point of saturation, and the indication is sharp within one drop of oil from a buret. This was confirmed by immersing pastes fully or partly saturated with oil according to the above standard in a bath of oil stock used for absorption. Saturated pastes do not absorb any more oil, while unsaturated pastes actually absorb oil almost equal to the calculated deficiency for saturation in 24-48 hours. Results are duplicable with a variation not exceeding 1 percent and oil-absorption values of some pigments have been revised according to this method. The end point should be located at the point of saturation where the whole pigment paste is most easily taken off on the palette knife in course of usual rubbing. Such a paste is coherent, stiff, puttylike and does not "break" or "separate." Nine references.

807. BARKER, J. Identification of pigments. *J. Oil Col.*, 25 (1942), pp. 240-246; *Review*, 15 (1942), p. 205.

The general properties of the different classes of organic pigments are discussed as an aid to their identification and the detection of W and Mo is considered in some detail. Notes are also given on the qualitative analysis of inorganic pigments.

808. BARNETT, C. E. Physics and chemistry of pigments. *Ind. Eng. Chem.*, 41 (1949), pp. 272-279.

Excellent review of the past 25 years; 121 references. Particle size is not important in pigments until the size approaches the wave length of the incident light. The optimum size for optical efficiency is of great interest but the problem is complicated and practical consequences will not be immediately forthcoming. The distribution of size should

receive greater attention, although effects of particle size do show up in the undertones of blacks, blues and reds. Light absorption and index of refraction are the most important factors in determining optical characteristics. In mixing pigments with vehicles, much evidence has been obtained concerning the importance of surface wetting. Several interesting curves given in the fine discussion of optical properties. Other sections are valuable for references on surface phenomena and developments of inorganic materials. RLF

809. BERNSTEIN, I. M. Microscopical identification of ultramarine blue in complex pigment mixtures. *Ind. Eng. Chem. Anal. Ed.*, 17 (1945), pp. 262-265; *C.A.*, 39 (1945), 2659.

A thin film of the ink or paint containing the pigment is spread on a microscope slide. In case the pigment is in dry form it is first dispersed in thin-bodied linseed oil. The film on the slide is then ashed *in situ* in a Bunsen flame. The slide is then examined. In the case of pigments containing no other heat-resistant blue pigments, ultramarine blue can be detected at 200 magnification when the pigment mixture contains as low as 3 percent ultramarine blue. At 1940 magnification 0.25 percent ultramarine blue can be detected. Co blues and violets are also heat-resistant and must be detected to differentiate with ultramarine blue. Co blues and violets can be detected by microscopical examination of an ashed slide before and after treatment with 4 N HCl. HCl decolorizes ultramarine blue but not Co blues or violets. Detection of ultramarine blue in the presence of Co blues is more difficult and requires substantiating tests. In the absence of sulphide a blue ash persisting after treatment with 4 N HCl means absence of ultramarine blue and presence of Co blue. A micromethod for detection of sulphide using a slide coated with acidified gel is described. In the presence of sulphide 2 methods can show ultramarine blue in the presence of Co blues: microscopical examination of the ashed film on a slide before and after treatment with acidified gel to detect destruction of blue pigment, and microscopical examination of an ashed film after treatment with 4 N HCl to detect the presence of cubic NaCl crystals, which are formed by the action of HCl on ultramarine blue.

810. BLANKSMA, J. J. Mercury, its oxide and sulphide, cinnabar and vermilion. *Chem. Weekblad.*, 44 (1948), pp. 456-464; *C.A.*, 45 (1951), 8825c.

A historical survey of the contributions made by Dutch scientists (Drebel, Fahrenheit, Boerhaave, etc.) and Dutch industry and commerce over the past three centuries to our knowledge and technology of Hg, Hg oxides and sulphides, cinnabar, and vermilion.

811. BONTINCK, ED. La chrysocolle. *Chim. peintures*, 8 (1945), pp. 364-367, illus.

The derivation of the name chrysocola, the use of that term in ancient literature, and previous occurrence of the natural mineral

hydrous copper silicate as a pigment is reviewed. A new occurrence of chrysocolla is reported by the author. This is on a wall painting dating from about 1300 in the nunnery of St. Trond, which was discovered under a layer of whitewash about 1860. The green is found on the nimbus behind the head of Christ and is painted over a black layer. The green layer crushes easily; the grains show little color by transmitted light and are amorphous in appearance. They seem to be agglomerates of little blisters without distinct contours and without flat faces. In reflected light the color is not so intense as malachite. The green is decomposed by acids, without effervescence; copper goes into solution and silica, which separates, gives characteristic silica skeleton when fused in a sodium phosphate bead. The pigment blackens on heating. It is not attacked by caustic soda in the cold. The author believes the pigment was applied in secco technique. He does not believe chrysocolla was used here for any particular reason but was used unknowingly in place of malachite. RJG

812. BONTINCK, ED. Historical notes. *Chim. peintures*, 10 (1947), pp. 8-9; *Abstract Review*, no. 130 (1947), p. 371.

Several facts in the history of the culture of the madder in Zeeland are given, and also notes about the detection of zinc oxide in 1741 and the purification of barytes in 1825.

813. BRUBACKER, D. G. Light and electron microscopy of pigments. *Ind. Eng. Chem. Anal. Ed.*, 17 (1945), pp. 184-187; *C.A.*, 39 (1945), 2210.

Many properties of pigments depend on size, distribution of size, and shape of the particles. The limit set on the resolving power of light microscopes is about  $0.11\mu$  for an ultraviolet microscope using light of  $2500 \text{ \AA}$ . wavelength and  $0.16\mu$  for a glass-lens microscope using  $3650 \text{ \AA}$ . wavelength. The transmission-type electron microscope has a best resolving power in routine practice of  $0.004\text{--}0.007\mu$ . The depth of field of a high-power light microscope used photographically is only  $0.1\mu$  or less. As a result, particles more than about  $0.05\mu$  from the object plane appear out of focus. Because of the low numerical apertures, the depth of field of electron microscopes is of the order of several  $\mu$ . Comparative photomicrographs of ZnO pigment samples were made and clearly show the superiority of the electron microscope for these studies.

814. CALEY, EARLE R. Ancient Greek pigments. *J. Chem. Educ.*, 23 (1946), pp. 314-316.

Identifications and analyses were made on pigment specimens scraped from objects and found in bulk during excavations of the Agora in Athens. These were: red ochre, yellow ochre, cinnabar, malachite, blue frit, white lead, and chalk. Quantitative analysis of red ochre scraped from a sherd showed it contains 13 percent  $\text{Fe}_2\text{O}_3$ . The possible origin of these pigments is related to information contained in *De Lapidibus* by Theophrastus of Eresos (late fourth century B.C.). RJG



815. CALEY, EARLE R. Ancient Greek pigments from the Agora. *Hesperia*, 14 (1945), pp. 152-156.

Similar to article by same author (*see* "Ancient Greek pigments," *J. Chem. Educ.*, 23 (1946), pp. 314-316), but not identical with it.

RJG

816. CARNAUT, BORIS M. Chemistry of paints and its relation to pictorial art. *Off. Dig.*, no. 286 (1948), pp. 871-875; *C.A.*, 43 (1949), 3209.

Pictorial art of the past 40,000 years is reviewed. Pictorial art material from the chalk and charcoal used in monochromic art through crushed brick and colored earths, fig juice, honey, eggs, wax, siccative oil, zinc oxide, Prussian blue, iron cyanide, ultramarine blue, cadmium reds and yellows, cobalt blue, chromium yellows, and up to synthetic resins. Thirty-five references.

817. CHARRIN, V. Green earths—their deposits in France. *Peintures, pigments, vernis*, 23 (1947), p. 307; *C.A.*, 42 (1948), 2211.

Green earths of different geological ages exist, principally in Cretaceous formations, where they are combined with Ca phosphate. It is suggested that in some localities, especially the Rhone Valley, they exist in sufficient quantity for industrial development. Glauconites, when of good quality, could be separated for use in paints; the remainder could be used in fertilizers.

818. CLARK, F. G. Coloring materials for copolymer vinyl chloride-acetate compounds. *Ind. Eng. Chem.*, 35 (1943), pp. 368-374; *C.A.*, 37 (1943), 3529.

The factors to be considered in selecting coloring materials for vinyl chloride-acetate copolymers are: specific behavior of the color in the presence of the stabilized copolymer vinyl resin, bleeding and blooming tendency, inherent light stability, heat stability, and covering power and dispersibility. The data reported refer to calendered, extruded, and molded compounds, but it is believed that they may be extended to vinyl lacquers. Tests for bleeding, light stability, and heat stability are described. A high bleeding rating is required for most compounds containing 10 percent or more plasticizer. Ratings, based on the above tests, are given for 70 coloring materials, listed by trade names, and 52 chemical types.

819. DÉRIBÉRE, MAURICE, and MORE, C. Cobalt pigments. *Chim. peintures*, 6 (1943), pp. 122-126; *Review*, 19 (1946), p. 4.

A review with fourteen references covering the history and occurrence of Co and the composition, crystal structure, properties, and uses of the Co pigments.

820. DUNCAN, D. R. The colour of pigment mixtures. *J. Oil Col.*, 32 (1949), pp. 296-321.

A detailed account of the many factors affecting the color of pigment mixtures, usually oversimplified as "subtractive mixture." Knowledge of coefficients of scatter and absorption makes it possible to predict the color range obtainable with a given set of pigments and to formulate mixtures of alternative pigments which will match in color. SRJ

821. DURUP, G. Standardization of color science terminology. *Peintures, pigments, vernis*, 25 (1949), pp. 171-177; *B.P.V.*, 22 (1949), p. 491; *Abstract Review*, no. 156 (1950), p. 90.

American, English, and French attempts to standardize color terminology are discussed, and the significance of the terms used in all three countries, together with some German terms, is defined. Nineteen references.

822. FARNSWORTH, MARIE. Ancient pigments. *J. Chem. Educ.*, 28 (1951), 72-76; *C.A.*, 45 (1951), 5419i.

Among a lot of pigments recovered from a well in Corinth and identified as originating in the first half of the second century B.C. were identified red and yellow ochres, realgar, dolomite, gypsum, litharge, Egyptian blue, cinnabar, and madder. Most interesting were four small lumps of rose madder. An original color sometimes called Hellenistic pink has frequently been observed on terra-cotta figurines and other painted objects from classical times, but here is presented for the first time spectrophotometric evidence that it is madder. RJG

823. FARNSWORTH, MARIE. Second century B.C. rose madder from Corinth and Athens. *Amer. J. Archaeol.*, 55 (1951), pp. 236-239; *C.A.*, 45 (1951), 9889e.

Microscopic examination of ancient pigment indicated madder. Al was confirmed by the spectroscope and by precipitation as  $\text{Al}(\text{OH})_3$ . The reflectance curve was similar to that of modern rose madder.

824. FISCHER, EARL K., and JEROME, CHARLES W. Pigment dispersion with surface-active agents. *Ind. Eng. Chem.*, 35 (1943), pp. 336-343; *C.A.*, 37 (1943), 2594.

The effect of surface-active agents on pigment dispersion was studied to aid in formulating general principles for such products as printing inks and paints. The experiments were limited to major types of pigment-vehicle systems as determined by basic wetting characteristics. The pigments used were: toluidine toner, barium lithol toner, iron blue, ultramarine blue, carbon black, and  $\text{TiO}_2$ ; the vehicles: linseed oil varnish, glycerol, mineral oil, and modified phenol resin varnish; the surface-active agents: Aerosol OT, Aresket 300, Benzidine, Cu-oleate, Daxad 33, Dupanol ME, Gilsonite, Ink Lengthener EE, Lecithin, Naccanol NR, Santomerse D, Sapamine KW, Tergitol 7, and Zn naphthenate. The effect of these agents on the pigment dispersion was measured by the change of plastic viscosity

and yield point, determined in a rotational viscometer. Conclusions: The greatest reduction of yield value has been observed in dispersions in which the pigment and vehicle are of differing wetting characteristics. The rate of pigment dispersion and the final strength of a pigment are indirectly related to the action of surface-active agents; with increased viscosity the disintegration of pigment aggregates on a roller mill is accelerated. By the use of these agents it is possible to obtain greater mobility in certain formulations; alternately the pigment content may be increased while the yield value is maintained within practical limits. Any useful effect shown is obtained by the use of not over 3 percent of these agents. Numerous references are given.

825. GETTENS, RUTHERFORD J. Lapis lazuli and ultramarine in ancient times. *Alumni*, 19 (1950), pp. 342-357 incl. 42 references.

Lapis lazuli was used in Mesopotamia for lapidary purposes over a long period. In the first millennium A.D. ground lapis mineral came to be employed for pigment purposes, and eventually it was carried all over Europe for painting and illuminating purposes. The evidence from many sources including the writings of early travelers, the history of commerce, and archaeological discoveries indicate that all the blue lapis mineral that was spread across Europe and Asia came from a single mine located in the narrow valley of the Kokcha River, a tributary of the river Oxus in the ancient province of Badakshan, which is in the northeastern part of Afghanistan. Recently (1932) a German geologist re-explored the Kokcha Valley, and he has given account of the geology of the area, a description of the ancient lapis lazuli mine (it now appears to be completely worked out), and a theory in respect to the genesis of the precious blue mineral. RJG

826. GREEN, HENRY. Physics of pigments in dispersed systems. *J. App. Phys.*, 13 (1942), pp. 611-622; *C.A.*, 37 (1943), 271.

Photomicrographs are used to describe various types of suspensions and to associate their physical properties with their structures.

827. HALL, LINDSAY F. Notes on the colour preserved on the archaic Attic gravestones in the Metropolitan Museum. *Amer. J. Archaeol.*, 48 (1944), pp. 334-336.

In making water-color copies it was noted whether the colors were "abundant" in "traces," "faint traces," or "very faint traces." Red, blue, black, and white are reported, but no identifications of material are made. RJG

828. HARGREAVES, K. G. Analysis of organic pigments. *J. Oil Col.*, 34 (1952), pp. 139-161, tables.

The identification of organic pigments by chemical means is considered. The four main groups are: azo pigmentary colors, lakes and toners of acid dyestuffs, lakes of basic dyestuffs, vat and other prod-

ucts. Only azo colors lend themselves to chemical analysis. Dry distillation with soda lime and sodium dihydrogen phosphate possess certain advantages. Tables I-VIII cover the general chemical behavior of the color groups. RJG

829. HILER, HILAIRE. *Color harmony and pigments*. Chicago, New York, Favor, Ruhl & company, 1942. 61 pp., illus., Hiler color chart.

Contents: Introduction; Systematizing color; Terminology; The Hiler color circle; Shades, tints and tones; Color harmony and the chart; Practice based on theory; Conclusion; Appendix; Bibliography. BMU

830. HOLTZMAN, HARRIS. Alkali resistance of the iron blues. *Ind. Eng. Chem.*, 37 (1945), pp. 855-861; *C.A.*, 39 (1945), 5089.

New iron blues have been formulated with increased resistance to alkaline environments, resulting from the addition of nickel salts during manufacture. Since iron blues have been formulated as salts of a polynuclear "berlinic acid," investigations were undertaken into the possibility of forming nickel and other metallic berlinates. No general stoichiometry was found for the latter; in fact, the usual formulas for the iron blues did not apply under the experimental conditions. The literature on the constitution of the iron blues is reviewed. Forty-six references.

831. JAKLITSCH, J. J., JR. Color comparator—"Briefing the record," *Mech. Eng.*, 71 (1949), pp. 241-242.

An accurate, precise color measuring and comparison instrument is described. SR

832. JUDD, DEANE BREWSTER. *Color in business, science, and industry*. New York, John Wiley & sons, inc.; London, Chapman & Hall, ltd., c1952. 401 pp., diagrs.

Contents: Introduction; Pt. 1. *Basic facts*: The eye—Aspects of color (basic terms)—Color matching—Color deficiencies; Pt. 2. *Tools and technics*: Spectrophotometry—Fundamental standards in colorimetry—Visual colorimeters—Reproduction of pictures in color—Colorimetry by difference—Color standards—Uniform color scales—Color languages; Pt. 3. *Physics and psychophysics of colorant layers*: Gloss—Opacity or hiding power—Kubelka-Munk analysis—Identification of colorants—Formulation of colorants; Appendix; References; Index.

Reviewed in: *Conservation*, 1 (1952/53), p. 94, by F. I. G. Rawlins. BMU

833. KLEIN, ADALBERT. *Farbe in der Malerei*. 2d ed. Würzburg, 1944. 121 pp.

Contents: Introduction; Color and coloring (Materials and technique); Nature of color; Meaning of color; Development of coloring in German painting, 1500-1800; Approach of Germans to color; Final remarks; Index. PC



834. LAUDERMILK, JERRY. The bug with a crimson past. *Natural Hist.*, 58 (1949), pp. 714-718, illus.

Describes the life cycle of the cochineal insect (*Dactylopius tomentosus*) relative of the historic Mexican variety (*Dactylopius coccus*) from which the dyestuff and pigment carmine was made. Cochineal was one of the principal discoveries of the conquistadores, and by about 1523 the Spaniards in Mexico were shipping to Spain as much cochineal as they could obtain. It was not until about 1630 that tin oxide was found to be the most suitable mordant for dyeing wool. Cochineal raising was transplanted to Europe and to the Canary Islands. The industry declined after 1874 because of competition with less expensive aniline reds. Cochineal bugs are still raised commercially in the state of Oaxaca, Mexico. Carmine is used mostly for making artists' colors and for coloring foods, drinks, and cosmetics.

RJG

835. LAWRENCE, J. Colours, pigments and media of the ancient world. *J. Dec. Art*, 69, p. 828 (1949), p. 61; *Decorator*, 49, no. 573 (1950), p. 81.

Passages from Cennini's book are quoted with suggestions regarding their interpretation. Fresco painting and the preparation of linseed oil for paints are described. Castor oil was used in a varnish in the twelfth century. The secret of the durability of old painted work might lie in the avoidance of organic binders. It is suggested durability might be enhanced if pigments were less finely ground than is now customary.

AEW

836. [LEMAIRE, E.] Naples yellow. *La Nature*, 69<sup>e</sup> année (1941), p. 313; *B.P.V.*, 18 (1945), p. 259; *Abstract Review*, no. 116 (1946), p. 149.

This pigment, much used by the Masters between the fifteenth and seventeenth centuries, is being used in increasing quantities today. The present-day pigment does not possess all the qualities of the old product. The true pigment is produced by calcining antimony oxide and white lead, and is an impure lead antimonate, but pale ochres and mixtures of cadmium sulphide with zinc oxide are also sold under the name of "Naples Yellow."

837. LIBERTI, SALVATORE. Analisi campione di colore (Casa di Grifi-Palatino). *Boll. ist. centrale restauro*, 9-10 (1952), p. 52.

Les résultats.

FD

838. LIBERTI, SALVATORE. Ricerche sulla natura e sulla origine delle alterazioni del cinabro. *Boll. ist. centrale restauro*, 3-4 (1950), pp. 45-64.

Noircissement du cinabre: nature et origine de l'altération. Remède.

PC

839. MAGURN, BLANCHE W. Daiitoku Myō-ō, a Japanese Buddhist deity. *B.F.M.A.*, 10 (1942), pp. 14-23.

The author discusses the style, iconography, and technique of a Japanese hand-colored print, sixteenth-early seventeenth century. R. J. Gettens identified the pigments and medium (see footnote 19, p. 23). Particularly interesting is the identification of one blue as smalt, since its early use in the Orient appears to be little known. Other pigments are indigo, malachite, orpiment, vermilion, an organic red dyestuff, a yellow dyestuff, iron oxide brown, lime white, carbon black. The medium is animal glue. EHJ

840. MAHDIHASSAN, S. Bacterial origin of some insect pigments. *Nature (London)*, 158 (1946), pp. 58-59.

Various pigments produced on insects by symbiotic bacteria are listed and special reference is made to the lac insect. LB

841. MARGIVAL, F. Colors and coatings in antiquity. *Peintures, pigments, vernis*, 26 (1950), pp. 467-474; *Abstract Review*, no. 170 (1951), p. 140.

A historical study of the colors used in ancient times. Numerous illustrations and references in the text.

842. MAYER, FRITZ. *The chemistry of natural coloring matters*; the constitutions, properties, and biological relations of the important natural pigments. Tr. and rev. by Arthur H. Cook. New York, Reinhold pub. corp., 1943. 354 pp. (American chemical society. Monograph series, no. 89.)

Contents: General introduction; Introduction; Foreword; Translator's note; Carotenoids (Polyene pigments); Diarylmethane compounds; Carbocyclic nitrogen atoms; General bibliography; Author index; Subject index.

Reviewed in: *J. Amer. Ceram. Soc.*, 65 (1943), p. 1442. BMU

843. MURRAY, HUMPHREY DESMOND, editor. *Colour in theory and practice*, a new ed. enl. and rewritten, by R. Donaldson and others. London, Chapman & Hall, 1952. 360 pp., illus.

Contents: *Physical and chemical aspects*: Some properties of light; The electromagnetic wave theory; Some radiation phenomena; Photochemical effects; The photoelectric effect; The absorption of light; Electronic wave forms; Colour and chemical constitution; *Physiological and psychophysical aspects*: The human visual apparatus; The character of the visual response; Colour matching and measurement; Systems of colour description and specification; Colour discrimination and tolerance; An explanation of the visual processes; Defective colour vision; *Light sources and colorimetry*: Light sources; Spectrophotometry; Visual colorimeters; Standard illuminants and artificial daylight; Physical photometers and colorimeters; *Miscellaneous aspects*: The

selective use of colour; Colour in nature; *Appendix*: A classification of natural and synthetic colouring matters; Tables; Extracts from the report on color terminology.      SRJ

844. OSCHMANN, M. Nickel carmine. *Peintures, pigments, vernis*, 19 (1943), p. 809; *Chem. Zentr.*, Pt. 2 (1943), p. 1851; *C.A.*, 38 (1944), 6111.

Nickel carmine (a Ni derivative of dimethylglyoxime containing 20.31 percent Ni), manufactured by introduction of a dilute NaOH solution of dimethylglyoxime into an ice-cooled, ammoniacal solution of NiSO<sub>4</sub>, filtration of the precipitate, washing and drying at 50-60°, is practically insoluble in water, very fast to light, of red-carmine color, produces in white paint a vivid pink color, and is especially suitable as water color because of its glazing effect.

845. PLENDERLITH, HAROLD JAMES. The history of artists' pigments. *Science Prog.*, no. 150 (Apr. 1950), pp. 246-256.

A lecture delivered to the Physical Society Colour Group. Beginning with the use of soot and earth colors the development of stable coloring materials is followed up to modern times. Artificial and derived pigments of the Egyptian and Roman periods are discussed. Other subjects are the classical dyestuffs, materials of miniature painting, buon fresco and easel painting, both tempera and oil. Beginning with the discovery of a method for making Prussian blue in 1704 the impact of the chemical age is traced up to recent times. The author regrets that the artist will continue to use cheap impermanent paints in spite of the availability of permanent materials and notwithstanding the great advances of the past century in our technical knowledge in respect to the properties of materials. Bibliography.      RJG

846. PRATT, LYDE S. *The chemistry and physics of organic pigments*. New York, John Wiley & sons, inc.; London, Chapman & Hall, limited, c1947. 359 pp.

Contents: Introduction; History; Color and chemical structure; Color and physical structure; Raw materials; Intermediates; Pigments from natural organic colors; Synthetic organic pigments; Testing of pigments; Identification of organic pigments; Pigment types and properties; Conclusion; Bibliography; Index.      BMU

847. QUIRING, HEINRICH. Vorphönizischer Königspurpur und *uqnû*-Stein. *Forschungen u. Fortschr.*, 21/23 (1947), pp. 98-99.

La pierre *uqnû*, dont l'utilisation dans le Proche-Orient remonte à la plus haute antiquité, serait le minerai d'arsenic: réalgar. Les textes assyriens ayant trait à son emploi sont commentés.      FD

848. RABATÉ, H. Ancient yellow, white and black pigments. *Peintures, pigments, vernis*, 23 (1947), pp. 358-359; 24 (1948), pp. 40-41, 104-105; *B.P.V.*, 21 (1948), p. 183; *Abstract Review*, no. 141 (1948), p. 240.

A general account of the pigments used by the Greeks and Romans, and also in the Middle Ages.

849. RABATÉ, H. Cobalt and cobaltiferous pigments. *Peintures, pigments, vernis*, 23 (1947), pp. 229–230; *B.P.V.*, 20 (1947), p. 381; *Abstract Review*, no. 135 (1948), p. 122.

An account is given of the preparation and properties of various cobalt pigments; their use as artists' colors is emphasized.

850. RABATÉ, H. French ochres from Berry. *Peintures, pigments, vernis*, 24 (1948), pp. 177–178.

A historical account of the ochres found in the Paris area, with special reference to Berry. Berry ochre was known to the Romans and was worked up to 1860. AEW

851. RABATÉ, H. Historical notes on the substitution of zinc oxide for white lead. *Peintures, pigments, vernis*, 26 (1950), pp. 355–356; *B.P.V.*, 24 (1951), p. 7; *Abstract Review*, no. 177 (1952), p. 56.

A review of this question, as it appeared in France in the period, 1850–1920.

852. RABATÉ, H. History of the manufacture of bronze colors. *Trav. peinture*, 5 (1950), pp. 365–366; *C.A.*, 46 (1952), 7339i.

Metallic powders of various colors were used by medieval artists on illuminated work. Further development was carried out in Germany and during the 19th century by H. Bessemer. The latter realized the necessity of obtaining flaky particles. A table is included of the constituents of various bronzes, some of which contain (besides Cu and Zn) Fe, Sn, and Al.

853. RABATÉ, H. Naples yellow. *Peintures, pigments, vernis*, 23 (1947), pp. 261–262; *B.V.P.*, 21 (1948), p. 89; *Abstract Review*, no. 138 (1948), p. 179.

A historical account of the production of Naples yellow and comments on present-day practice.

854. RABATÉ, H. Red pigments of antiquity. *Peintures, pigments, vernis*, 23 (1947), p. 69; *B.P.V.*, 20 (1947), p. 167; *Abstract Review*, no. 128 (1947), p. 334.

An account is given of the red pigments used by the Greeks and Romans. The most commonly used pigments were iron oxide, cuprous oxide and red lead. Other pigments were cinnabar and realgar.

855. REMINGTON, JOHN STEWART. *Pigments—their manufacture and properties*. 2d ed. London, Abacus, 1949. 194 pp., illus.

Contents: Introduction; Basic carbonate white lead; Basic lead sulphate; Zinc oxide; Leaded zinc oxide; Lithopone; Zinc sulphide; Titanium oxide; Antimony oxide; Barytes and blanc-fixe; Whiting;



Gypsum or terra-alba; Ultramarine; Ferrocyanide blue; Lead chromes; Zinc chrome; Lead cyanamide; Cadmium pigments; Brunswick green or chrome green; Zinc chrome green; Guignet's green; Natural iron-oxide colors; Synthetic oxides and ochres; Raw and burnt umber, sienna, and Vandyke brown; Red lead; Cobalt blue and cobalt violet; Black pigments; Organic coloring matters. BMU

856. RICHMOND, LEONARD. *The technique of colour mixing*. New York, London, Pitman publishing co., 1949. 79 pp., illus., 8 col. pls. (incl. palette with color arrangement).

Contents: Introduction; Colour theory; Colour mixing in oils; Mixing, superimposing, and blending water-colours; Colour mixing and planning a picture in oil-colour; Body colour on tinted paper; Colour and the various media. BMU

857. RITTNER, EDMUND S., and SCHULMAN, JAMES H. Studies on the coprecipitation of cadmium and mercuric sulfides. *J. Phys. Chem.*, 47 (1943), pp. 537-543.

The physical and chemical states of sulfides prepared from mixtures of cadmium and mercury salts are discussed. New data on the black variety of mercuric sulfides given. RLF

858. TANABE GIICHI 田邊義一. Vermilion of Japanese Stone Age. *J. Anth. Soc. Japn.*, 58 (1943), pp. 453-464.

Red pigments painted on Jōmon earthen wares preserved in the Anthropological Institute of Tokyo University were chemically studied and found to be iron oxide red and vermillion. KT

859. TINSLEY, S. G. Rutile type titanium pigments. *J. Oil Col.*, 32 (1949), pp. 233-270.

History of the development of rutile titanium dioxide. The physical properties of anatase and rutile forms and their effect on performance. Comparative exposure tests establish the superiority of the fine particle rutile pigment. SRJ

860. UEMURA ROKURŌ 上村六郎. Studies on the litharge paintings (*Mitsuda-e*) in the Shō-sō-in. *Sci. Pap. Japn. Antiques*, no. 3 (Jan. 1951), pp. 26-28.

Preliminary experiments. Color changes of pigments mixed with lac, oil, and Japanese lacquer were studied. Vermilion and orpiment alone remained unchanged in Japanese lacquer, while the lac and oil vermillion, red lead, iron oxide red, orpiment, yellow ochre, malachite, azurite, litharge, and white lead preserved their original colors. KY

861. WOODBRIDGE, RICHARD G. Ultramarine—an inorganic preparation. *J. Chem. Educ.*, 26 (1949), p. 552.

Directions are given for the preparation on a laboratory scale of ultramarine blue pigment, which is chemically identical with the

natural semiprecious gem stone, lapis lazuli. The charge composition is kaolin 100 parts (by weight), anhydrous sodium carbonate 100, charcoal 12, sulphur 60. It is important that these be finely ground together. RJG

862. WÜLLEN-SCHOLTEN, WILHELM VAN. *Pigment-Tabellen*. Hanover, Curt R. Vincentz Verlag, 1949. 119 pp., tables.

Inhaltsverzeichnis: I. Definitionen und Übersichten. II. Tabellen über anorganische Pigmente und Hilfsmittel. III. Übersichten sowie Eigenschaften von Farbstoffen und Körperfarben. IV. Tabellen über Farbstoffe, bzw. Farblacke und Pigmentfarbstoffe. Anhang. BMU

863. YAMASAKI KAZUO 山崎一雄. Chemical studies on ancient painting materials. *Sci. Pap. Japn. Antiques*, no. 1 (1951), pp. 27-30.

Pigments used in the wall paintings of temples in Japan were chemically studied. Among the existing wall paintings which amount to 68, that of the Hōryūji is oldest. Pigments used in it are china clay, red ochre, cinnabar, red lead, yellow ochre, litharge, azurite, malachite and carbon. There are no marked differences between the pigments of Hōryūji (end of seventh century) and wall paintings of eighteenth century, except white pigment. Before Kamakura period china clay was used, while in and after Momoyama period calcium carbonate was used. The time of change is not yet determined with certainty, but it seems to be Muromachi period (fifteenth-sixteenth century). KY

864. YAMASAKI KAZUO. Chemical studies on ancient pigments in Japan. *J. Chem. Soc. Japn. Pure Chem. Sect.*, 711 (1950), pp. 411-412; *C.A.*, 45 (1951), 6853b.

Pigments used in the wall paintings of various temples, such as Hōryūji and Hō-ōdō, were studied chemically. In the wall paintings of Hōryūji, which is of about the end of the seventh century, use was made of cinnabar, red ochre, red lead, yellow ochre, litharge, malachite, azurite, and carbon applied to mud walls coated with china clay.  $\text{CaCO}_3$  does not appear to have come into use as a white pigment until a later date.

865. YAMASAKI KAZUO. Chemical studies on the pigments of ancient ornamented tombs in Japan. *Sci. Pap. Japn. Antiques*, no. 2 (1951), pp. 8-14.

Colored ornaments of about 40 ancient tombs distributed in northern Kyushu, mainly in Fukuoka and Kumamoto Prefecture, were chemically studied. The ornaments and figures painted in the inner walls of stone chambers are concentric circles, triangles, magical geometrical figures, bird, ship, swords, bow, arrows, quiver, horse and man. The pigments used are red ochre, yellow ochre, china clay, charcoal, a black mineral containing manganese which is probably pyrolusite, and powders of green rocks containing chlorite. Malachite,

azurite, and cinnabar were not found. The most numerous figures are red concentric circles. The date of these ornamented tombs is supposed to be about 500-700 A.D. KY

866. YAMASAKI KAZUO, and SHIBATA YUJI. The chemical studies on the pigments used in the Main Hall and pagoda of Hōryūji temple (Nara, Japan). *Bijutsu kenkyū*, no. 144 (1947), pp. 225-231 and no. 145 (1947), pp. 269-273; *Proc. Japn. Acad.*, 24, no. 2 (1948), pp. 11-15; *C.A.*, 45 (1951), 8265a.

The paintings, which represent the Paradise of Buddha and figures of Bodhisattva, were painted more than 1,000 years ago with inorganic pigments on mud walls, prepared with a thin coating of white clay. Pigments identified by spectrographic methods were: cinnabar, iron oxide, yellow ochre, red lead (discolored brown), brown hydrated iron oxide, malachite, azurite, and carbon. The paintings were badly damaged by fire in January 1949.

867. YAMASHITA SHINTARŌ 山下新太郎 *Abura e no kagaku* 油絵ノ科学. Science of oil painting. Tokyo, Kogakusha Co., 1948, 163 pp., illus.

Contents: . . . Litharge; Pigments and their chemical composition; Oil; Supports; Varnish; . . . KY

### 3. DYES

868. BENDER, MAX. Colors for textiles; ancient and modern. *Interchem. Rev.*, 4 (1945), pp. 75-87, illus.

A review of ancient textile dyes including indigo, wood, logwood, madder, Tyrian purple, kermes, cochineal, colors used by the American Indians, and the more important classes of modern dyestuffs, pigments, and auxiliary-application compounds. Bibliography with 19 references. RJG

869. BENDER, MAX. The story of decorated textiles. *Interchem. Rev.*, 7 (1948), pp. 3-14.

Review of hand methods of dyeing and decorating. Nineteen references. RLF

870. BROWN, BRUCE. Some ancient natural dye sources. *Rayon and Synthetic Textiles*, 29 (Feb. 1948), pp. 92-93; (June 1948), p. 97; (Aug. 1948), p. 89.

Brief description of the sources, history, and special uses of the principal ancient textile dyes, namely: weld, brazilwood, logwood,

barwood, camwood, orseille, cudbear, annato, cutch, quercitron, and the fustics. RJG

871. FESTER, GUSTAVO A. Coloring material of ancient Peru. *Archeion*, 25 (1943), pp. 3-4, 195-196; *C.A.*, 38 (1944), 3172; Cf. *C.A.*, 35 (1941), 6469.

The origin of the vegetable coloring matter found on the Paracas fabrics is discussed.

872. HAYASHI KŌZŌ 林孝三 and SUZUSHINO GEN. 涼野元. Chemical studies on the nature of vegetable dyestuffs of several silk fragments found in the Fujiwara coffins at Chūson-ji temple. *Sci. Pap. Japn. Antiques*, no. 3 (Jan. 1952), pp. 40-44.

Silk fragments found in the coffins with Fujiwara mummies of the twelfth century at Chūson-ji temple were chemically examined. Vegetable dyestuffs identified were *Rubia akane* (red), *Phellodendron amurense* (yellow), *Coptis japonica* (?) (yellow), *Miscanthus tinctorius* (?) (yellow), *Polygonum tinctorium* (blue), and *Lithospermum erythrorhizon* (violet). KY

873. HAYASHI KŌZŌ 林孝三 and SUZUSHINO GEN. 涼野元. Identification of vegetable dyestuffs printed on ancient Japanese silk-wares. (Supplement.) Observations on fluorescence of vegetable dyestuffs by ultra-violet radiation. *Sci. Pap. Japn. Antiques*, no. 3 (Jan. 1952), pp. 36-39.

Fluorescence of ancient silk cloths colored with vegetable dyestuffs was studied under a mercury lamp. Yellow dyes containing berberin showed intense greenish yellow fluorescence and safflower rouge, weak pinkish fluorescence. Other dyes showed no fluorescence. KY

874. KIERSTEAD, SALLIE PEASE. *Natural dyes*. Boston, Bruce Humphries, inc. c1950. 104 pp., illus.

Contents: Introduction; Dye plants and how to extract the dye; How to dye wool; How to dye wool, using mordant first, followed by dye; Fancy dyeing of several shades in the same skein; What mordants are and what they do; Mordant formulae; How to mordant wool; How to mordant cotton and dye silk; How to test the fastness of dyes; Natural dyes which were used in ancient times and are still used; Natural dyes from the woods, fields, and roadsides, and garden weeds; The birth of natural dyes; Why use natural dyes; Collecting materials for dyes; How to dry and store petals for future use; A dyer's laboratory; Sources of dyes arranged alphabetically; Partial list of dye plants arranged by colors; Compound colors; Tie-dyeing; Dyeing thoughts; Bibliography; Index. BMU

875. LEECHMAN, JOHN DOUGLAS. *Vegetable dyes*. Toronto, Oxford press, 1943. 55 pp.



Contents: Introduction; Materials and methods (handling wool, mordanting, preparing the dye-bath); Dye-plants; List of dye-plants arranged by colours; List of dye-plants arranged alphabetically; Recipes. BMU

876. LEECHMAN, JOHN DOUGLAS. *Vegetable dyes from North American plants*. St. Paul, The Webb publishing company; Toronto, The Oxford university press, 1945. 55 pp.

Contents: By way of introduction; Materials and methods—Handling wool—Mordanting—Preparing the dye-bath; Sources and qualities; Dye-plant colors; Dye-plants; An alphabetical list; Dye-plants considered individually, with recipes; Index. BMU

877. LEGGETT, W. F. *Ancient and medieval dyes*. Brooklyn, Chemical publishing co., 1944. 116 pp.

Contents: Introduction; The vegetable dyes—madder, indigo, woad saffron, safflower, weld, brazilwood, logwood, barwood, camwood, the fustics, orseille, cudbear, annatto, turmeric, cutch, gambir, quercitron; The animal dyes—Tyrian purple, kermes, cochineal, lac; The mineral dyes; Bibliography. BMU

878. MAIRET, MRS. ETHEL M. *Vegetable dyes; being a book of recipes and other information useful to the dyer*. Brooklyn, N. Y., Chemical publishing co., 1942. 68 pp. First issued 1931.

Contents: Wool, silk, cotton, and linen; Mordants; British dye plants; The lichen dyes; Blue; Red; Yellow; Brown and black; Green; The dyeing of cotton; The dyeing of silk; Glossary; Bibliography; Index. BMU

879. SCHAEFFER, A. New views with regard to Tyrian purple. *Chem.-Ztg.* 65 (1941), pp. 273-275; *C.A.*, 37 (1943), 261.

Historical discussion of the production and use of Tyrian purple. It is shown that the "doubly colored" purple consists of two components, a red dye which is not very fast and a violet dye which is more fast. The violet component corresponds to 6,6-dibromoindigo which Friedländer obtained by synthesis and from *Murex brandaris*. The identification of the red component is not certain. S. believes it is probably a 2,3-bisindolindigo (Indigo Red), which corresponds to the red component in tint and fastness. The so-called "Cardinal's purple" has been produced since 1464. It is pure kermes dyestuff and is unrelated to Tyrian purple.

880. STROMBERG, ELIZABETH. Dyes and light. *ICOM News* (App. III), no. 3 (1950), pp. 1-4.

These are comments on a display which demonstrates the destructive effects of light on dyed materials, particularly textiles. It was arranged in the Nordiska Museet simultaneously with the ICOM Committee on Museums Display that was held in Stockholm, May, 1950.

The main purpose of the display was to present the most impressive specimens available of damage caused by daylight and artificial light. Mostly the exhibits dated before 1850 when modern synthetic dye-stuffs were discovered. In addition to affecting the dyes, sunlight reduces the tear-strength of fabrics. The time necessary to reduce the tear-strength of cotton fibers by 50 percent when exposed to full sunlight without any protection is 940 hours; flax 990; jute 400; wool 1,200; chrome-dyed wool 1,900 and cultivated silk 200 hours. The thickness of the material diminishes the effect to some extent. Most of the old-time "natural colors" showed less than satisfactory light-fastness by modern standards. Dark yellow cellophane, contrary to popular opinion, does not afford protection to fading. Fading does not proceed to a certain point and then stop. It continues until all the color has disappeared. Fading is caused by artificial light as well as by sunlight although it is usually slower because the intensity is less. Diffused daylight will cause fading in poor colors. Unless the dangerous part of the light spectrum can be eliminated by filters the only way to protect light-sensitive dyes is to keep them in absolute darkness as much as possible. RJG

881. YOUNG, STELLA, compiler. *Navajo native dyes; their preparation and use*. Recipes formulated by Nonobah G. Bryan. . . . Illustrated with drawings by Charles Keetsie Shirley. Chilocco, Oklahoma, Chilocco agricultural school, 1940. 75 pp., illus. (U. S. Office of Indian affairs, Education Division. Indian handicrafts, 2.)

Contents: Introduction; Mrs. Bryan dyes the yarn for a rug; Additional observations regarding native dyes; Preparing wool; Selecting and mixing natural colors of wool; Whitening wool; Mordants; The dyeing of yarns—recipes [using native plants]; Red dye for moccasins. BMU

#### 4. INKS

882. BARROW, WILLIAM J. Black writing ink of the (American) Colonial period. *Amer. Archiv.*, 11 (1948), pp. 291–307, charts.

Iron-gall inks were used almost exclusively. As the quill pen was a common writing instrument in America and England a fluid writing ink was necessary. Old recipes and books on ink are discussed. Black iron-gall inks are more acid, hence more destructive to paper than brown inks. The inks which remain black contained sufficient tannic and gallic acids to balance its quantity of iron in the copperas. Results of National Bureau of Standards tests on inks and papers are reviewed. Nearly all the early manuscripts tested were much higher

in acidity, than is now permitted in paper selected for permanent records. Bibliography. RJG

883. BARROW, WILLIAM J. New non-acid permanent iron ink. *Amer. Archiv.*, 10 (1947), p. 338.

The ink, which has been perfected by the Organic Section of the U. S. National Bureau of Standards, is composed of iron, ammonia and gallic acid (*di-ammonium hydroxyferrigallate*). Because it is non-acid it does not injure paper and it does not clog fountain pens. The characters written with it become insoluble in a few hours. RJG

884. MITCHELL, C. AINSWORTH. Ink in relation to crime. *Analyst*, 68 (1943), pp. 103-106.

An address dealing largely with the legal aspect, but listing cases involving evidence on ink and references to scientific methods. LB

885. VITOLO, A. E., and FORNARI A. Analytical research for examining manuscripts, in criminology, by the method of Boldrini. *Minerva méd. legale*, 72 (1952), pp. 33-36; *C.A.*, 47 (1953), 3756f.

The method of Boldrini (*Arch. antropol. criminale, psichiat. e med. legale*, 59 (1939), p. 156) was found satisfactory for making a comparative analysis of the ink of a manuscript. Many observations are noted on the behavior of the various inks with Boldrini's reagents.

886. WORRELL, WILLIAM HOYT. Note on modern Coptic inks. *Isis*, 37 (1947), pp. 149-150.

In Upper Egypt Coptic manuscripts with an antique appearance are still made by a few romantic individuals. The colored inks are simply modern commercial pigments dissolved in water which is thickened with gum. A translation is given for directions dictated by an Arab on how he makes iron-gall ink. RJG

## M. MEDIUMS, DRYING OILS, TEMPERA, AND OTHER FILM MATERIALS

887. ADAMS, H. E., and POWERS, P.O. Mechanism of heat-bodying linseed oil. *Ind. Eng. Chem.*, 36 (1944), pp. 1124-1127; *C.A.*, 39 (1945), 1064.

Alkali-refined linseed oil was heat-bodied at 305° under the following conditions: under vacuum, under an atmosphere of N, and under an atmosphere of N with 1 percent PbO added to the oil. Samples were withdrawn at intervals and the following properties determined: Wijs I value, density, specific refractivity, *n*, acetone insolubles,

molecular weight, hydrogen absorption and in some cases heat of combustion. Study of the data obtained indicates the formation of an intermediate compound which may be an intrapolymer resulting from formation of a six-membered ring between unsaturated acid chains in the same glyceride molecule. Ester interchange is a logical explanation for the disappearance of the intrapolymer and the appearance of an interpolymer of higher molecular weight as bodying progresses.

888. ANDRÉ, E. *L'altération spontanée des corps gras; moyens de l'éviter et d'y remédier*. Paris, 1942. 15 pp. (Cours-Conférences du Centre de perfectionnement technique, Paris. no. 735.)

Theoretical considerations on various kinds of alterations of fatty substances. Identifications with color reactions. Stabilizing agents. Remedies. PC

889. AULT, WALDO C., COWAN, J. C., KASS, J. P., and JACKSON, J. E. Polymerization of drying oils—comparative rates of polymerization of esters of isomeric octadecatrienoic acids at 275° in vacuum. *Ind. Eng. Chem.*, 34 (1942), pp. 1120–1123; *C.A.*, 36 (1942), 6360.

The rates of thermal polymerization at 275° of the various conjugated trienoic esters investigated have the same order of magnitude, although methyl pseudo eleostearate polymerizes slightly faster than its positional isomers, methyl  $\alpha$ - and methyl  $\beta$ -eleostearate. These rates are much more rapid than those of the two unconjugated trienoic fatty acid esters examined. The fact that the geometrically isomeric forms of the trienoic acid esters have approximately the same rates of thermal polymerization, but at the same time have widely different oxidation rates, may account for the anomalous behavior of certain oils in which no previously predictable correlation has been found between speed of gelation and rate of drying. Additional evidence in conformity with Scheiber's theory of isomerization (*C.A.*, 24, 978) and the Kappelmeier theory (*C.A.*, 27, 4425) of diene mechanism of polymerization of unsaturated fat acids or their esters has been presented. By a simplified interpretation of 1,4-diene addition of conjugated trienoic acids, structures for a bicyclic trimer and a tricyclic dimer have been suggested to account for the physical properties of the polymerized products.

890. BENNETT, HARRY. *Practical emulsions*. Brooklyn, Chemical publishing co., inc., 1943. 462 pp.

Contents: Preface; Introduction—Part I. General: Emulsifying agents; Types of emulsions and foams; Methods, formulation and equipment; Stability; General technical emulsions; Dispersing agents; wetting agents; Emulsifying agents list; Demulsifying and defoaming agents list; Part II. Formulas: Agricultural spray emulsions; Cutting oils, soluble oils, miscible oils; Emulsifying agents; Bituminous emulsions; Cleaners and soaps; Cosmetic and drug emulsions; Defoaming



agent; Food emulsions; Gasoline emulsions; Lacquer emulsions; Leather treatment emulsions; Lubricant emulsions; Medicinal emulsions; Paint emulsions; Paper processing emulsions; Polish emulsions; Textile emulsions; Waterproofing emulsions; Wax emulsions; Miscellaneous; Dispersions; Index.

Reviewed in: *U. S. Quart. Bk. Rev.*, 3 (1947), p. 315.

BMU

891. BRUMMER, ERNÖ. Tempera adhesives in the history of art. *Technicka (Budapest)*, 23 (1942), pp. 78-83, 123-128; *Chem. Zentr.*, Pt. 2 (1942), p. 495; *C.A.*, 37 (1943), 4584.

The physiochemical basis of paint binders in the painting of the Middle Ages.

892. Cincinnati-Dayton-Indianapolis-Columbus paint and varnish club. The effect of aluminum stearate on embrittlement of highly pigmented oil films. *Off. Dig.*, no. 286 (1948), pp. 826-831; *Paint, Oil, Chem. Rev.*, 111, no. 23 (1948), pp. 52-54; *C.A.*, 43 (1949), 3210.

The effect of aluminum stearate as an ingredient of artists' oil colors and its bearing on the aging characteristics of the film over periods up to 8 years are reported. Aluminum stearate 2 percent seems to be optimum quantity, and evidence indicates it has very effective plasticizing action. Films reached max. hardness in 6-12 months and returned to original hardness after 8 years. A device for measuring hardness is illustrated.

893. COLOMB, PIERRE. The yellowing of linseed oil. *Ind. vernice*, 4 (1950), pp. 64-66; *C.A.*, 44 (1950), 10346.

A linseed oil decolorized with fuller's earth which yellowed strongly in diffused light, and another bleached with 0.5 percent  $Bz_2O_2$  (*C.A.*, 44, 9695f) which yellowed only slightly, were subjected to chromatographic analysis by means of  $Al_2O_3$ , from solutions in petroleum ether. The former gave a green band (5 mm.), a colorless zone (100 mm.), and a yellow band (10 mm.) while the latter gave only a yellow band (10 mm.) preceding a colorless zone (105 mm.). The green band of the former oil carried the characteristic linseed oil odor. The extracted colorless materials yellowed much less than the starting oils. Mucilaginous matter, antioxidants (e.g., 2-naphthol), and Co-Pb, Co-Mn, or Co-Pb-Mn driers favored yellowing. Co naphthenate alone, as well as combination driers after settling precipitated Pb soaps, did not favor yellowing.

894. ELM, A. C. Deterioration of dried oil films. *Ind. Eng. Chem.*, 41 (1949), p. 319.

A survey with 17 references. Evidence is noted that ether-linkages may be subjected to peroxide formation and subsequent decomposition. Aldehyde and ketone groups are suspected to arise on oxidative decomposition. Yellowing increases with unsaturation but opinions

are divided as to the effect of conjugation. The latest approach may test the suggestion that hydroperoxides form at the methylene group adjacent to double bonds, leading to the formation of alpha-beta unsaturated ketones. Compounds related to the phoron structure might arise; Phoron is yellow. RLF

895. FRILETTE, VINCENT J. Drying oil and oleoresinous varnish films; increase in acidity on aging. *Ind. Eng. Chem.*, 38 (1946), pp. 493-496; *C.A.*, 40 (1946), 4230.

Lack of suitable method for determining acid nos. of oil and varnish films has retarded the investigation of the fundamental chemical changes that occur during the life of such films. An accurate semi-micro titration method was developed, and changes in acidity of the films were studied by this method. Air-dried oil and oleoresinous films rapidly develop acidity, about half of which can be extd. with MeOH. Alkali resistance is determined mainly by the acid values of the films. Resins appear to act as diluents, the acidity arising mainly from oxidation of the oil. Phenolic resins inhibit acidity formation more than other resins. Tung oil develops much less acidity than linseed; this accounts for its use in alkali-resistant formulations. Wrinkling and disintegration by NaOH solution are both evidences of swelling and are equivalent in evaluating alkali resistance. Oleoresinous coatings dried by baking do not develop acidity on drying. This last conclusion substantiates previous statements that chemical reactions involved in baking and air-drying differ.

896. GOIFFON, R. Color reaction of higher fatty acids. *Ann. biol. clin. (Paris)*, 6 (1948), p. 282; *C.A.*, 42 (1948), 8110.

The sulphate or chloride of Nile blue (I) produces a red color with neutral fats and a blue color with soaps. At pH 12, I turns red, but in the presence of soaps, such as the oleates, a complex is formed which raises the point of color change to pH 13. This reaction detects as little as 0.2 mg. Na-oleate in a vol. of 10 cc. It does not take place in the presence of alcohol or acetone. The color is proportional to the amount of oleic acid present and can be used for colorimetric determination. It does not work for free fatty acids having one or more double bonds.

897. HESS, P. S., and O'HARE, G. A. Oxidation of linseed oil. *Ind. Eng. Chem.*, 42 (1950), pp. 1424-1431; *C.A.*, 44 (1950), 9161d.

The effects exerted by differences in reaction temperature on induction period and on bulk oxypolymerization of raw linseed oil under otherwise constant conditions of air flow and agitation are discussed. At 84-200° the initial viscosity increase rate is identical for temperatures. At a definite point in the oxidation a change occurs in the viscosity increase rate, making it possible to show at least three distinct temperature regions (about 130°, 84-130°, and below 84°) each characterized by different types of oxidative changes. In the inter-

mediate temperature range the length of the induction period decreases exponentially with unit increase in temperature; the induction period is of very short duration at 130° and above. During the initial stages of oxypolymerization the peroxide value increase is independent of the temperature in the 84-200° range; the maximum value, however, is a definite function of temperature, higher values corresponding to lower reaction temperatures. Ultraviolet absorption analyses indicate that the formation of diconjugated systems reaches a maximum and that at 84-200° the diene configuration as determined by the characteristic inflection at 232m $\mu$  is never appreciably greater than 5 percent; higher values are obtained at lower reaction temperatures. The results obtained in this study agree with the free radical propagation theory of oil oxidation and appear to indicate the formation of an intermediate prior to oxidative molecular weight increases may take place partially by association of intermediates to double molecules by H bonding.

898. KRONSTEIN, MAX. Medieval surface techniques. II. *Amer. Paint J.*, 32, no. 34 (1948), pp. 92-94, 96, 98, 100; *C.A.*, 42 (1948), 5238.

Before the period of oil paints and varnishes there were 2 groups: (1) embodied the principle of closing the color substance in an inorganic medium, such as the paint enclosure in glass, the painting of stained glass windows, or the painting of china, (2) embodied the principle of mixing the pigments with media such as glue, gelatin, or egg white. Around 1750 A.D. the basic foundation had been laid from which the industrialized varnish and paint production could get its start as an industry.

III. *Ibid.*, 32, no. 36 (1948), pp. 30, 32, 34, 36.

A review of the beginnings of the oil paints and varnishes.

899. Minnesota. University, and American chemical society, Minnesota Sect. Drying oils; a symposium, 1947. *Ind. Eng. Chem.*, 41 (1949), pp. 280-324.

Articles include "The Solexal process" of oil extraction, "Synthetic drying oils," "Isomerization of drying oils," "Mechanism of the oxidation of drying oils," \* "Thermal polymerization of esters of drying oil acids," "Deterioration of dried oil films." \* Immediately preceding are related articles: "Twenty-five years of paint testing" and "Physics and chemistry of pigments," \* the latter includes 121 references. (Articles with asterisk have been abstracted). RLF

900. POWERS, P. O. Mechanism of the oxidation of drying oils. *Ind. Eng. Chem.*, 41 (1949), p. 304.

A survey with 41 references. Process of oxidation is envisioned as: 1, Induction period due to inhibition by antioxidants. 2, Peroxide formation of unknown mechanism and structure. 3, Peroxide decomposition through dehydration, rearrangement, rupture, etc. 4, Poly-

merization. 5, Degradation. There is growing evidence that oxygen bridges are not the principal cross-linking components. RLF

901. REMINGTON, JOHN STEWART. *Drying oils, thinners and varnishes*. London, Leonard Hill, 1946. 144 pp., illus. (incl. plans), diagrs.

Contents: Preface; Introduction; Drying oils; Thinners; Varnishes; Bibliography; Appendix—Rapid varnish arithmetic. BMU

902. RUDD, H. W. The chemistry of drying oils. *Paint Manuf.*, 13 (1943), pp. 95–103; *Abstract Review*, no. 84 (1943), p. 143.

The various theories which have been advanced to describe the mechanism of polymerization are discussed.

903. WATROUS, JAMES. Observations on a late medieval painting medium. *Speculum*, 22 (1947), pp. 430–434.

Students have long been interested in a recipe in the late medieval manuscript of Jehan Le Begue in which a paint medium is made from fish glue, white wax, and gum mastic incorporated in a lye solution prepared from wood ashes and lime. Earlier translations had certain bad errors which made the recipe unworkable. Some have had trouble in preparing a painting medium from the recipe because of the curdling of mastic resin—but this can be prevented by reducing the alkalinity with dilute sulphuric acid until it barely turns litmus paper blue. The medium can be prepared to paint thinly or with heavy impasto. It sets quickly. Unlike egg tempera it does not remain tender for some time but in a few hours becomes resistant to scratching and can be burnished. RJG

## N. ADHESIVES

904. Aero research, Ltd., Duxford, Eng. *Structural adhesives; the theory and practice of gluing with synthetic resins*. London, Lange, Maxwell & Springer Ltd., 1952. 203 pp., illus., tables, charts.

Lectures given in Cambridge at the summer school "The Technology of synthetic resin adhesives" held by Aero Research limited, Duxford, Cambridge, from September 23 to 29, 1951.

Reviewed in: *J. Inst. Metals*, 19 (1952), p. 688; *Conservation*, 1 (1952/54), pp. 140–142, by A. E. Werner. BMU

905. BRAUDE, FELIX. *Adhesives*. New York, Chemical publishing co., 1943. 154 pp.

Contents: Theory and application; Tests for adhesives; Raw materials; Flour pastes and starch adhesives; Dextrin adhesives; Casein



adhesives; Vegetable glues; Animal glues; Sodium silicate adhesives; Rubber dispersions and solutions as adhesives; Miscellaneous adhesives; Equipment for the manufacture of adhesives; Water insoluble adhesives; Rubber adhesives; Rosin and its derivatives; Gums and resins (natural and synthetic materials); Wax adhesives; Putties; Index. BMU

906. DE BRUYNE, NORMAN ADRIAN, and HOUWINK, ROELOF, Editors. *Adhesion and adhesives*. New York, Amsterdam, London, Brussels, Elsevier pub. co., 1951. xv, 517 pp., illus.

Contents: Preface; Part I. Theoretical aspects, General conditions for wetting and for adhesion, by R. Houwink; Molecular forces, by A. J. Staverman; Rheology of adhesives, by J. Hoekstra and C. P. Fritzius; Static problems, by C. Mylonas and N. A. De Bruyne; Part II. Technological aspects: Organic adhesives (Animal glues . . . by Earl D. Cornwell) (Vegetable adhesives, by William M. Lee) (Synthetic resin adhesives, by F. Chapman) (Asphaltic bitumen, by R. N. J. Saal); Inorganic adhesives and cements, by John H. Wills; Rubbery adhesives, by G. Salomon and W. J. K. Schönlaue; Adhesion in soldered joints, by W. R. Lewis; The physical testing of adhesion and adhesives, by N. A. De Bruyne; References at end of each subdivision; Indexes.

Reviewed in: *Conservation*, 1 (1952/54), p. 140-142, by A. E. Werner. BMU

907. DELOLLIS, N. J., RUCKER, N., and WIER, J. E. Comparative strengths of some adhesive-adherend systems. *Trans. Amer. Soc. Mech. Engrs.*, 73 (1951), pp. 183-193.

Superiority of polyvinyl acetate adhesive over casein, rubber, and gum arabic shown. Resorcinol-formaldehyde adhesive better for long-term loading. RLF

908. HAMER, WALTER J. An improved method of measurement of gel strength and data on starch gels. *J. Res. Nat. Bur. Stand.*, 39 (1947), pp. 29-37.

Strength of gels made with cornstarch, wheat starch, wheat flour, arrowroot, rice, and others discussed in detail. RLF

909. KAUFERT, F. H., and RICHARDS, C. AUDREY. *A procedure for measuring the mold resistance of protein glues*. Madison, Wis., 1943. 5 pp. (Forest products laboratory. Rept. no. 1344.)

The humidity or incubative chamber may be a large stone crock or wash boiler with loose-fitting cover. An inch or two of water is placed in the bottom of the container and a platform to hold specimens is built of wood or bricks. To serve as sources of infection, sheets of fresh veneerwood are cut smaller than the container and are dipped in a thin casein or soybean glue solution which has been infected with mold spores from an old molded sheet. The veneers are soaked

in the inoculated glue one hour. The infected sheets are stacked horizontally with spacers within the chamber and left to incubate four days at temperature 72–95°F. Standard plywood shear specimens, glued to manufacturer's directions (or prepared in any desired way, with or without preservatives) are dipped in water and laid on the molded veneers. Container, loosely covered, is kept at room temperature or slightly above. Joint strength tests are made on the shear specimens weekly or at greater intervals. A table shows the result of mold test on yellow birch shear specimens glued with several commercial casein and soybean glues. Results are shown for these glues with and without addition of preservatives which include orthophenylphenol, pentachlorophenol, sodium orthophenylphenate, and sodium pentachlorophenate. Effect of these preservatives on maintenance of shear strength during continued mold exposure is marked.

RJG

910. KLINE, G. M., and REINHART, F. W. Fundamentals of adhesion. *Mech. Eng.*, 72 (1950), pp. 717–722; *C.A.*, 44 (1950), 9725.

The physical and chemical fundamental theory relative to the use of adhesives is reviewed. Stronger bonded assemblies can often be secured by designing bonded joints in accordance with these theories. Sixty-nine references.

911. McLAREN, A. D., and SEILER, CHARLES J. Adhesion III. Adhesion of polymers to cellulose and alumina. *J. Polymer Sci.*, 4 (1949), pp. 63–74.

Method of measuring tack temperature and adhesion given. Polyvinyl acetate series AYAC to AYAT, vinyl chloride-ethylene copolymers, vinyl acetate-methyl vinyl ketone and vinyl chloride-vinyl acetate-maleic acid copolymers studied. Effect of solvent, temperature, and humidity on adhesion shown.

RLF

912. McLAREN, A. D., LI, T. T., RAGER, ROBERT, and MARK, HERMANN. Adhesion IV, The meaning of tack temperature. *J. Polymer Sci.*, 7 (1951), pp. 463–471.

Added evidence that all amorphous polymers have equal viscosities at their tack temperature. This gives the tack temperature a characterizing role, just as the brittle point, softening point, etc.

RLF

913. MAXWELL, J. W. Shear strength of glue joints as affected by wood surfaces and pressures. *Trans. Amer. Soc. Mech. Engrs.*, 67 (1945), pp. 104–110.

Includes data on glue penetration and relationship between glue thickness and shear strength.

RLF

914. MOSES, S., and WITT, R. K. Evaluation of adhesion by ultrasonic vibrations. *Ind. Eng. Chem.*, 41 (1949), p. 2334.

Description of apparatus and sample calculations are given.

RLF

915. MOSES, S. The nature of adhesion. *Ind. Eng. Chem.*, 41 (1949), p. 2338.

Adhesion tested by ultrasonic method described in article on p. 2334. Author suggests that solvent or plasticizer molecules are necessary in a resin film for high adhesion. Thus, after different drying times, a given film gave different values of adhesion. Loss of plasticizing molecules is faster once the film has parted from surface and evaporation can take place from under side of film as well as upper.      RLF

916. OLSON, W. Z., and BRUCE, H. D. Polyvinyl-resin emulsion wood-working glues; a study of some of their properties. *South. Lumberman*, 175, no. 2196 (Oct. 1, 1947), pp. 59-66, illus.; *F.P.L. Report R1691* (1947), 9 pp., tables, figs.

Results of a series of tests of 11 glues of this type from eight different manufacturers, and of animal and casein glues. Tests included original strength tests, tests at elevated temperatures, static load tests and studies of the effect of wood moisture content, assembly conditions, and rate of strength development.

917. PERRY, THOMAS D. Durability of urea-formaldehyde adhesives. *Mod. Plastics*, 25 (1948), pp. 88-91, illus.

Ten years of practical experience show that these adhesives are adequate under a wide variety of conditions and that they are superior to casein in moisture resistance.      RJG

918. PERRY, THOMAS D. Wood to metal adhesives. *Mech. Eng.*, 68 (1946), pp. 1035-1040.

Materials and methods are comprehensively covered with data and illustrations.      SR

919. SMITH, LEE T., and HAMILTON, R. M. Starch adhesives. *Chem. Eng. News*, 22 (1944), pp. 1482-1484, 1494-1496; *C.A.*, 38 (1944), 6007.

A review presenting a history of the development and uses of starch adhesives, together with a discussion of adhesion theories, adhesive requirements for specific purposes and methods of determining the comparative properties of different types. One hundred forty-seven references.

920. TRAU, T. R., and SELBO, M. L. Results of accelerated tests and long-term exposures on glue joints in laminated beams. *Trans. Amer. Soc. Mech. Engrs.*, 70 (1948), pp. 393-400.

Description of an accelerated aging procedure which shows excellent correlation with results of weathering.      RLF

921. TURNER, PHILIP S. Thermal-expansion stresses in reinforced plastics. *J. Res. Nat. Bur. Stand.*, 37 (1946), pp. 239-250.

In order to obtain a strong adhesive bond, it is suggested that the coefficient of expansion of the component parts be matched, thus reducing stresses. The coefficients of expansion on a number of ply-woods and adhesives are presented. A formula for calculating the coefficient of expansion of mixtures is given. RLF

922. U. S. Forest products laboratory, *Madison, Wis.* Commercial synthetic-resin glues. *F.P.L. Report*, 1336A (1947), 4 pp., tables.

One hundred fifty-one current synthetic resin glues are classified as to type, form, and general operating characteristics. A list of the names and addresses of the manufacturers of these adhesives is also indicated.

923. U. S. Forest products laboratory, *Madison, Wis.* Synthetic-resin glues. *F.P.L. Report*, 1336 (rev. 1948), 21 pp.

Includes discussion of the classes and characteristics of synthetic resin glues, and the advantages, disadvantages, and limitations of each type. Consideration is given briefly to adhesives for bonding metal to wood.

924. VERRIER, LINDSAY. A pressure-cooked non-moulding adhesive flour paste. *Nature (London)*, 164 (1949), p. 545.

Lindsay Verrier claims for this recipe that gives a paste of uniform consistency which is not messy to make and is nonpoisonous. RMO

#### O. NATURAL RESINS, NATURAL RESIN VARNISHES, AND ORIENTAL LACQUER

925. BASU, SADHAN. Study of optical properties of shellac solutions, *J. Phys. & Colloid Chem.*, 54 (1950), pp. 1358-1366.

Shellac does not form a molecularly dispersed or a colloidal solution, but appears to form loose aggregates of molecules similar to cybotactic groups in liquids. RLF

926. BRANDI, CESARE. Some factual observations about varnishes and glazes. *Boll. ist. centrale restauro*, 3-4 (1950), pp. 9-29, 2 illus., 1 pl.

Examen de textes anciens se rapportant aux vernis et glacis de peintures. PC

927. DRAKE, C. E., and KENNAN, H. W. The water permeability of some rosin and metal rosinat films. *J. Oil Col.*, 29 (1946), pp. 273-283.

Films were prepared on paper supports and their water permeability measured by a technique involving  $P_2O_5$  and a microbalance. The permeability increased exponentially with temperature. SRJ



928. DYER, AGNES S. Oriental lacquer work. *Interchem. Rev.*, 4 (1945), pp. 35-46, illus.

An outline of the history of lacquer and lac in China, Japan, Siam, and India with brief discussion of the chemistry, steps in the fabrication of wares, and a list of colorants used in lacquer. Bibliography with 22 references. RJG

929. EMOTO YOSHIMICHI 江本義理. Materials for the repair and preservation of Japanese antiques. *Sci. Pap. Japn. Antiques*, no. 1 (Jan. 1951), pp. 56-58.

Chemical natures of the various materials used for repair of antiques, such as Japanese lacquer, and synthetic resin are discussed. KY

930. FELLER, ROBERT L. Hardness and flexibility of natural- and synthetic-resin varnishes. *Museum News*, 29 (April 1952), pp. 7-8.

The scratch- and rocker-hardness of spirit varnishes was established in the order: mastic, damar, isobutyl polymethacrylate, polyvinyl acetate, normal butyl polymethacrylate. Damar was found to be less brittle than mastic, during the first few months, but in time the two varnishes tend to become almost identical in hardness and tendency to crack. The synthetic resins are considered an entirely different class of materials from damar and mastic and they offer wide possibilities in new picture varnishes. RLF

931. HAAS, GERRIT DE. Chemistry of gum dammar. *Pharm. Weekblad.*, 84 (1949), pp. 505-515.

Difficulties in the preparation of stable, clear solutions of dammar are discussed. An acidic amorphous residue remaining when dammar is dissolved in benzene, chloroform, carbon disulphide, or turpentine is identified as the mucoid material which causes trouble in filtering. The name damati acid is proposed for the material; its properties and empirical formula  $C_5H_8O$  are given. AEW

932. HAAS, GERRIT DE. Purifying dammar resin. *Dutch patent* 65,604, Apr. 15, 1950; *C.A.*, 44 (1950), 6168.

Crude dammar resin is purified by dissolving it in a mixture of aromatic and chlorinated hydrocarbons, separating the insoluble impurities and then drying the clear solution. In an example 100 g. crude dammar resin is dissolved in 75 g. benzene, while the solution is diluted with 200 g.  $CHCl_3$ . After clarifying by settling, the clear solution is concentrated and finally dried by spraying *in vacuo*. A light-colored resin is obtained.

933. HOWES, F. N. Age-old resins of the Mediterranean region and their uses. *Econ. Botany*, 4 (1950), p. 307.

A general discussion of the sources and uses of mastic, sandarac, dragon's blood, frankincense, laudanum, asafoetida, galbanum, am-moiacum, and liquid and solid storax. AEW

934. KELSO, J. L., and POWELL, ALFRED R. Glance pitch from Tell Beit Mirsim. *B.A.S.O.R.*, no. 95 (1944), pp. 14-18.

In a room in one of the houses of Iron II level at this site, the excavators found a large quantity of a bitumen in the bottom of a broken pithos. This was identified as glance pitch on the basis of its appearance, solubility in carbon disulfide and in chloroform, moisture content, volatile matter present, fixed carbon content, and the amount of ash. Suggestions are made as to probable source of this material and its possible uses. ERC

935. KRONSTEIN, MAX. The black varnish resin of the ancient surface technology. *Amer. Paint. J.*, 32, no. 17 (1948), pp. 68, 70, 72; *Abstract Review*, no. 133 (1948), p. 70.

The Egyptians produced a black varnish coating which was not a bituminous material. The material is alcohol-soluble, but since the Egyptians did not use alcohol as a solvent, it seems probable that it was applied in a semisolid condition. Some authorities have assumed that it was a black Indian dammar, but these are not now shipped in a semi-solid condition, and are not soluble in alcohol. It is suggested that the resin of the sweetgum (*Liquidambar*), or an Oriental species of this genus, may have been used. This is a honey-colored liquid, containing a large amount of cinnamic acid and its derivatives, and darkens on exposure to light. Small amounts of styrene may be recovered from it. This may be the earliest use of styrene in surface coatings.

936. LEE, E. D. America's own fossil resin. *Interchem. Rev.*, 6 (1947), pp. 91-102.

Description of Utah resin found in conjunction with coal mining there. Soluble in low-solvency hydrocarbons. RLF

937. LETTERS, KARL. Old and new violin varnishes. *Farbe u. Lack*, 58 (1952), pp. 293-296; *C.A.*, 46 (1952), 9860i-9861a-e.

Meinel (*Akust. Z.* 1937, 27) has found by oscillographic studies that the varnish does not essentially change the character of sound of violins, except that a pliable varnish can cut down the durations of the oscillations; Cremona violin varnishes (1550-1750) still exhibit thermoplastic properties, but are somewhat brittle towards shock. Their outstanding property is their fiery brown, yellow, or red color which can be brought out by polishing. The varnishes are very sensitive to alcohol, perhaps because of their porosity. Early attempts to match varnishes and the findings and recipes of Michelman (*Violin Varnish*, 1946 (*C.A.*, 40, 6269<sup>7</sup>)) are discussed. L's tests on varnish samples from a number of old Italian violins gave the following results: (1) A Josef Guarnerius, fil Andreae had a transparent, fiery golden-yellow, fairly brittle, and nonthermoplastic varnish which charred without melting; it was very slightly soluble in EtOH and only little more soluble in C<sub>6</sub>H<sub>6</sub>, saponified with a waxy

odor, and left an ash containing much Fe. (2) A Ferdinand Gagliano had a yellowish brown, pliable, nonthermoplastic varnish; it was soluble in EtOH with a yellow color and a resinous color, and the solution turned reddish brown with  $\text{NH}_4\text{OH}$ , indicating gum gutti; its ash contained Fe. (3) A Camillo Camilli had a brownish, soft, nonthermoplastic varnish; it dissolved partially in EtOH to a yellow solution with a resin odor; Fe was present.  $\text{C}_6\text{H}_6$  also extracted some saponifiable oil. (4) A Carlo Antonio Testore had a pale brown, elastic, nonthermoplastic varnish; it was soluble in EtOH with a resin odor; Fe was present. (5) A Venetian master (?) had a reddish brown, fairly hard, nonthermoplastic varnish which was soluble in EtOH; Fe was present. The woods were brown or brownish. The varnishes gave a dark-red fluorescence (as that of metal resins) under a quartz lamp, but this is also found with dragon's blood or propolis. The varnishes are thought to contain Fe as a resinate because of their clearness (cf. Becker, *Instrumentebau Z.* 1948, 1). The resinous or waxy odors may have come from finishing varnishes. Varnishes made according to Michelman's recipes have beautiful colors but show some brittleness after 1-2 years. Additional work led to the use of polyvinyl acetate (Mowilith N) as a suitable binder the films of which were thermoplastic, glossy, capable of high reversible swelling in  $\text{H}_2\text{O}$  (Hintz, *C.A.*, 35, 6347<sup>7</sup>), and imparted good tone quality to violins even in overheated rooms. To make a varnish, a resinate was first prepared by saponifying 54 grams pale rosin with 2.7 g. NaOH and 5.4 g.  $\text{Na}_2\text{CO}_3$  in 37.9 g.  $\text{H}_2\text{O}$ , diluting to 500 ml., and precipitating with 300 ml. 5 percent  $\text{Fe}_2(\text{SO}_4)_3$  solution, the Fe was collected, washed with  $\text{H}_2\text{O}$ , dried at  $80^\circ$  and powdered. The yield was 35 grams of a product containing 10.6  $\text{Fe}_2\text{O}_3$ . Next 7 g. of Fe resinate, 4 g. turpentine, 4 g. raw linseed oil, and 3 g.  $\text{EtOC}_2\text{H}_4\text{OH}$  were ground up, and the product was mixed with solution of 36 g. 60 percent Mowilith N, and 3 g. Clophen in 9 g.  $\text{EtOC}_2\text{H}_4\text{OH}$ , 16 g. BuOAc, 8 g. toluene, and 10 g. BuOH. The resulting varnish was somewhat cloudy, settled out a precipitate and was applied in several coats which each required several days to dry. More BuOH was added before additional coats. The wood turned yellow, as is desirable, when it was exposed to the sun after a primer coat of Mowilith.

938. MACLAREN, N., and WERNER, A. E. Some factual observations about varnishes and glazes. *Bur. Mag.*, 92 (1950), pp. 189-192.

In reply to Brandi (*Bur. Mag.*, 91 (1949), p. 183) a careful analysis is made of his arguments and of additional historical evidence. Alternative interpretations are given of the observations made on the three pictures cited by Brandi. The terms *varnish*, *glaze*, and *patina* are defined.

SRJ

939. MICHELMAN, JOSEPH. Additional confirmatory evidence of the re-discovery of the old Italian varnish. *Science*, 112 (1950), pp. 337-338.

On the basis of previous work by the author (Cf. *Science*, 107 (1948), p. 679) a varnish was prepared by a method believed to have been used by the old Italian violin makers. Spectrographic analysis of this varnish and of that from a Stradivarius violin showed that the same metals were present in both and that their proportions were very similar. ERC

940. MICHELMAN, JOSEPH. Confirmatory analysis of the "lost" Italian varnish. *Science*, 107 (1948), pp. 679; *C.A.*, 42 (1948), 7548.

Microchemical and spectrographic analysis of varnish from a Francesco Ruggieri cello (1691) has shown the presence of madder and resinous or fatty acids together with large amounts of Ca. These results indicate the use of madder and Ca rosinate with pretreated linseed oil. This was confirmed by prepg. such a varnish; when applied in thin films and exposed at once to light it gave a red-brown film of the desired depth of color, transparency, and permanency.

941. MICHELMAN, JOSEPH. Confirmatory evidence of the rediscovery of the "lost" Italian violin varnish. *Amer. Paint J.*, 32 (1948), pp. 62, 64, 67-68, 70-71, 74; *C.A.*, 42 (1948), 2783.

Spectrographic and microchemical analyses indicate that metal resinsates and linseed oil were used. Si found in the ancient varnishes is probably derived from the alkali prepared from wood ashes used in their preparation and from solutions of the metal salts.

942. MICHELMAN, JOSEPH. *Violin varnish, a plausible re-creation of the varnish used by Italian violin makers between the years 1550 and 1750 A.D.* Cincinnati, O., The author, 1946. xi, 185 pp.

Contents: Introduction; Principal previous publications; Miscellaneous previous publications; Publications pertaining to colors; Criteria for the varnish; Materials and methods; Formulation of earliest varnishes; Chemistry of the varnishes; The orange colored varnishes; The yellow varnishes; The red varnishes; Preliminary treatment of the wood; Varnishing, drying and polishing; Other resins and soaps; The old coloring agents; Alizarine as a coloring agent; Previous work from past to present.

Reviewed in: *J. Amer. Chem. Soc.*, 70 (Apr. 1948), pp. 1673-1674, by R. J. Gettens. BMU

943. SALVI, COLOMBO. Rosin in amphorae. *Pitture e vernici*, 6 (1950), p. 104.

A few grams of material found in one of the Albenga amphorae had the following properties: softening point 60°C.; M.P. 68°C.; acid no. 92; saponification value 124; soluble in benzene and EtOH, largely soluble in white spirit; positive Morawski test. The material is almost certainly *rosin*, which appears unchanged and in excellent condition after 2,000 years. AEW



944. SHERWOOD, P. Violin varnishes. *Can. Paint Varnish Mag.*, 22, no. 10 (1948), pp. 28, 59-60; *C.A.*, 45 (1951), 8266f.

The composition of violin varnishes, particularly of the Cremona school, is discussed. There is considerable evidence to show that a fairly wide range of compositions give superb results.

945. STEFFENS, HERBERT G. Determination of modulus of elasticity of varnish films: effect of water immersion. *Ind. Eng. Chem., Anal. Ed.*, 17 (1945), pp. 417-418; *C.A.*, 39 (1945), 3945.

A method of preparing strain-free detached varnish films together with an improvised tensiometer of simple design for determining the modulus of elasticity of a film and measuring its change during water immersion is described. The method is applied particularly to insulation varnish. Data are included to show the reproducibility of the method.

946. WANG TIAO-HSIN. The Chinese varnish of the Sung dynasty. *Artibus Asiae*, 11 (1948), pp. 111-114, illus., tables.

Varnish on a wooden coffin dated 1160-1210 A.D. excavated at Shaowu, Fukien, was made of tung oil and pigment. The brownish-yellow pigment used in the thick under layer was natural ochre. The bright red pigment of the thin outer layer was ferric oxide from heating ochre. Analytical data on the vehicle and pigment are given.

RJG

## P. POLYMERS, PLASTICS, AND SYNTHETIC COATINGS

947. ACHHAMMER, BERNARD G., REINEY, MARY J., and REINHART, FRANK W. Study of degradation of polystyrene using infrared spectrophotometry. *J. Res. Nat. Bur. Stand.*, 47 (1951), pp. 116-125.

Mechanism postulated for the degradation of this widely used plastic. Styrene is also an integral part in GRS type synthetic rubber.

RLF

948. BEACHELL, HAROLD C., FOTIS, PETER, and HUCKS, JANET. A study of the oxidative degradation of polyvinyl formal. *J. Polymer Sci.*, 7 (1951), pp. 353-376.

Mechanism of degradation given. Development of color and loss in weight followed.

RLF

949. BIEK, LEO. Protective coatings for silver. *M.J.*, 52 (1952), pp. 60-61; *C.A.*, 46 (1952), 9866a.

Various acrylate and methacrylate lacquers and emulsions are proposed and sources of supply given. A method of electrolytic plating of Ag with an invisible thin film of Be oxide to prevent tarnish is mentioned.

950. BLACK, GEORGE. Hardness testing of organic coatings. *Products Finishing (Amer.)*, 13 (1949), pp. 32, 34, 36, 40, 42, 44, 46; *C.A.*, 43 (1949), 7239.

Review of methods dealing with scratch hardness, pendulum hardness, indentation resistance, impact resistance, tensile strength (detached films), other distensibility tests, and resistance to abrasion.

951. BOYER, R. F. A statistical theory of discoloration for halogen-containing polymers and copolymers. *J. Phys. & Colloid Chem.*, 51 (1947), pp. 80-106.

Theory developed to explain yellow color in terms of conjugated double-bonds.

RLF

952. BRADFORD, E. B. Electron microscope study of plasticized latices. *J. Appl. Phys.* 23 (1952), pp. 609-612, illus.

Silicon monoxide replicas of the surfaces of air-dried films are shown which were cast from a Saran latex containing various amounts of plasticizer. It can be observed that the poor films are composed of discrete individual particles while in a continuous transparent film the particles have coalesced into a polymeric mass. Replicas of surfaces of films are shown which were produced from different types of synthetic latices before and after they had been plasticized.

Author's abstract

953. BROWN, ALFRED E. Fungal growth in synthetic resins and plasticizers. *Mod. Plastics*, 23 (1946), pp. 189-195, 254, 256; *C.A.*, 40 (1946), 4557.

Aside from the slight susceptibility of cellulose nitrate, polyvinyl acetate, and melamine formaldehyde polymers, synthetic resins are very resistant to fungal growth. Fatty acid derivatives, natural oils and cottonseed-containing glyceryl esters of fat acids are susceptible. Fungal resistance is developed by the incorporation of fungicides. Salicylanilide gave the best protected plastics. Vinyl copolymers are rendered fungistatic with less than 1 percent of phenol mercuric salicylate. Phenolic resins are difficult to protect. No treatment is known that will inhibit fungal growth on all plastics.

954. CLARK, FRED G. Accelerated and outdoor weathering of colored vinyl films. *Ind. Eng. Chem.*, 44 (1952), pp. 2697-2709, figs., tables.

This paper deals mainly with a comparison of commercial accelerated aging units of the carbon arc-light type with natural sunlight.

In the brief [p. 2506] it says: "A study of 25 films under 12 outdoor conditions and in two accelerated machines, Fade-Ometer and X1A Weather-Ometer, was made. In New Jersey it required 2.8 winter sun hours and in Florida 1.6 winter sun hours to equal 1.0 sun hour in summer, which showed Florida to be more consistent the year round. With window glass covering, 40% longer time than with direct exposures was required to reach the same degree of degradation. A temperature rise increased rate of decomposition by 40% but the rate of fading of colors by only 10% on the outdoor test. On the average 1.5 hours in the Fade-Ometer were required to equal 1.0 hour in the X1A unit for fading of colors, but there were marked deviations. The X1A Weather-Ometer decomposed compounds at the same rate as it faded colors, while the Fade-Ometer decomposed compounds 1.9 times as fast as it faded. Hence, the X1A unit was concluded to be the more reliable." RJG

955. COLES, HAROLD W., SCHULZ, WALTER F., LEVY, SYLVIA, and WHEATLEY, THOMAS A. Optical lens coatings. *Mod. Plastics*, 25 (1948), pp. 123-126, 167-170, 172, 174, 176-181, illus., tables.

Results of physical tests on 29 clear plastic materials available for coatings on glass are listed. The lacquers were applied to the lenses by the spinning method. Physical properties of the many plastics are so different that no one test procedure can be considered satisfactory. The information should be of interest to those concerned with the preparation of clear coatings for paintings. RJG

956. COUMOULOS, G. D. The electron diffraction by amorphous polymers. *Proc. Roy. Soc. London*, A-182 (1943), pp. 166-179; *C.A.*, 38 (1944), 3887; *Abstract Review*, no. 97 (1944), p. 186.

Electron-diffraction experiments are made with a series of synthetic polymers in which the length of the side chain in the repeating unit is progressively increased. The polymers studied are vinyl acetate, methyl acrylate, ethyl acrylate, methyl methacrylate, ethyl methacrylate, butyl methacrylate, cyclohexyl methacrylate,  $\beta$ -ethoxyethyl methacrylate. Dilute solutions of the polymers in acetone, toluene or benzene are placed on water and evaporated, the resulting thin lens being then examined with electron diffraction. Structure is derived from the haloes. The configurations of the polyvinyl acetate, the acrylate and the methacrylate polymers suggest a zig-zag C atom chain for the long main chain. No crystalline features can be detected in the amorphous structure. It is concluded that the polymers are in a liquid state. Relationships between the elastic properties and the proposed structures are discussed. Relationships between chain flexibility and structure are reviewed. Because of the stiffness of the main chain the Kuhn theory of elasticity cannot be applied. It is pointed out that the main chain of methacrylate can coil, and the extension is due chiefly to the rotation of the side chains and is approximately proportional to their length. This does not hold for

very long side chains like octadecyl methacrylate because crystallization takes place at the end of the side chains. A smaller proportion of the extension may be due to the spiral of the main chain. The more flexible acrylate will have a smaller diameter, the main chain contributing more to the elasticity.

957. DOOLITTLE, ARTHUR K. Vinyl resin coating composition. *U. S. Pat.* 2,316,323, Apr. 13, 1943. *Abstract Review*, no. 82 (1943), p. 110.

Alkoxy acetones, such as ethoxy acetones, are excellent solvents for vinyl resins, and have an evaporation rate about that of butyl acetate. They have excellent tolerance for lacquer diluents.

958. DOTY, PAUL M., AIKEN, WILLIAM M., and MARK, HERMANN. Water-vapor permeability of organic films. *Ind. Eng. Chem., Anal. Ed.*, 16 (1944), pp. 686-690; *C.A.*, 39 (1945), 854.

An apparatus for the determination of water-vapor permeability is described. It is also possible to measure the value of two constants, solubility coefficient, and diffusion velocity, which together determine the vapor permeability of a film. The dependence of permeability on film thickness, vapor pressure and temperature is discussed. The permeability constant is affected by hydrophile material or polar groups that sorb water. Permeability is an exponential function of temperature. The mechanism of permeation is discussed. Permeability measurements were made on films of koroseal, polythene, saran, pliofilm, vinylite, and cellulose (uncoated cellophane).

959. EDWARDS, J. D., and STROHM, D. B. Measuring permeability to carbon dioxide and water vapour. *Mod. Packaging*, 19, no. 2 (1945), pp. 157-159, 190; *Review*, no. 112, p. 226.

A method is described which involves filling a cell with an absorbent for the gas or vapour, applying a film of the material under study over the mouth of the cell and sealing it in position with wax, weighing, placing the covered cell in an atmosphere of the gas or vapour for the desired period of time, and reweighing. Some permeabilities are given, including those for cellophane, polyvinylidene chloride, rubber hydrochloride, polyvinyl chloride, and Et cellulose.

960. Fracture of solids, including methyl methacrylate polymer. *Nature (London)*, 163 (1949), p. 377.

At a conference held by the British Rheologists' Club, Mr. Hall described investigations on methyl methacrylate at the Royal Aircraft Establishment which had confirmed that tensile stress combined with solvent vapor absorption caused crazing.

RMO

961. HARTLEY, G. S. Diffusion and swelling of high polymers. I. The swelling and solution of a high-polymer solid considered as a diffusion process. *Trans. Faraday Soc.*, 42 B (1946), pp. 6-11. discussion pp. 29-33; *C.A.*, 42 (1948), 8520b.



The swelling of a high polymer can be described in terms of only one diffusion coefficient. The existence of visible boundaries leads to the conclusion that the diffusion coefficient must vary with concentration and exhibit a maximum at intermediate concentrations. Since molecules of different sizes will diffuse at different rates, it is necessary to assume that the diffusion mechanism is supplemented by a movement of the swollen polymer as a whole. This movement of the two components together can be demonstrated by following, under the microscope, the movement of foreign particles inserted in the polymer. To facilitate measurement of this movement the foreign particles can be inserted in the form of a scale. This is conveniently done by engraving a scale on one side of a polymer film, filling the engraved groove with an inert finely divided solid, and placing another unscratched sheet of the polymer on top of the first. Entrapping of air can be prevented by pressing out a drop of a suitable liquid between the sheets. Experiments with commercial cellulose acetate as the polymer,  $\text{TiO}_2$  as the foreign matter, acetone as the solvent, and tritolyl phosphate as the liquid used to displace air, clearly demonstrate the movement of the swollen polymer as a whole, and are in full agreement with the theoretical predictions. The maximum of the diffusion coefficient and the movement of the swollen polymer as a whole represent two factors which make the swelling process clearly distinguishable from a simple solution-by-diffusion process. The reverse process—the shrinking and drying of a swollen polymer—is mathematically much more complicated than the swelling process.

962. HARTLEY, G. S. Diffusion and swelling of high polymers. III. Anisotropic swelling in oriented polymer film. *Trans. Faraday Soc.*, 45 (1949), pp. 820-832; *C.A.*, 44 (1948), 871*b*.

The penetration of oriented cellulose acetate film in the plane of the film by various solvents and swellers is much more rapid normal to the preferred direction of the macro-molecule axes than parallel thereto. Certain "abnormal" solvents which are peculiar also in that they give rise to a sharply serrated front of attack in penetration of isotropic film are excepted. It is doubtful whether there is any penetration at all parallel to the macromolecule axes in highly oriented film securely clamped against lateral expansion. With less oriented film and oblique penetration there is also a quantitative abnormality in that depth of penetration is initially more nearly proportional to time ( $t$ ) than to  $\sqrt{t}$ .

963. HAUSER, PAUL M., and McLAREN, A. DOUGLAS. Permeation through and sorption of water vapor by high polymers. *Ind. Eng. Chem.*, 40 (1948), pp. 112-116.

Comprehensive study of factors affecting permeability of selected thermoplastic films to water vapor. Nylon, polyvinyl butyral, cellulose acetate, polyethylene, polyvinyl alcohol, vinylidene chloride-acrylonitrile copolymer, regenerated cellulose, and rubber hydrochloride investigated.

SR

964. HOEKSTRA, JOH, and NIJVELD, K. A. W. The determination of the hardness of organic films. *Rec. trav. chim.*, (1948), pp. 685-689 (in English); *C.A.*, 43 (1949), 2788d.

An apparatus is described for the determination of indentation hardness and associated properties of organic films. (See the complete abstract for detailed information.)

965. HOLLABAUGH, C. B., and BURT, LELAND H. Carboxymethylcellulose—uses and applications. *Ind. Eng. Chem.*, 37 (1945), pp. 943-947; *C.A.*, 39 (1945), 5477.

A review, with 94 references, of the uses of carboxymethylcellulose in the textile, paper, and food industries, and in drugs and cosmetics, ceramics, leather, paints and lacquers, adhesives, films and filaments, and miscellaneous materials.

966. HONNELAITRE, ANTONIN. Impermeability of protective films. *Peintures, pigments, vernis*, 17 (1942), pp. 534-539; *C.A.*, 37 (1943), 6145; *Abstract Review*, no. 88 (1944), p. 3.

The  $H_2O$  permeability of a paint film depends on the structure and chemical composition. The permeability for liquid  $H_2O$  and  $H_2O$  vapor can be directly determined by simple methods.  $H_2O$  permeability is determined by the weight increase of lacquered beech wood cakes by immersion in  $H_2O$ ;  $H_2O$ -vapor permeability, by the weight loss of tumblers filled with  $H_2O$ , sealed airtight with the film to be tested and placed in a desiccator. Both methods give comparable results. With films of nitrocellulose, permeability increases with decreasing N content (12-10.5%); with acetyl cellulose the permeability is greater, especially with lower acetyl content; benzylcellulose is more impermeable than most nitrocellulose; ethyl cellulose is just as permeable as acetyl cellulose with low acetyl content. Rubber chloride has very low permeability.

967. JAKLITSCH, J. J., JR. Archaeology—"Briefing the record" *Mech. Eng.*, 71 (1949), pp. 678-679.

A description of the preparation of an accurate reproduction of a cuneiform inscription by means of rubber latex molds is given as part of this news section. SR

968. KORCEZEE, A. E., and MOL, E. A. J. Diffusion of water vapor through high polymeric membranes. *J. Polymer Sci.*, 2 (1947), pp. 371-380; *C.A.*, 41 (1947), 7202; *Abstract Review*, no. 132, p. 41.

Because of the difference in molecular structure, organic high polymers do not show the absolute water impermeability of metals. The polymers consist of long, chain-like molecules or loose networks or clews, so that intermolecular cavities can appear easily, thus offering easy passage for water and other small molecules. Mathematical relations are derived for the diffusion of water through an organic

membrane, in which space the water vapor concentration changes in one direction only, diffusion through membranes without retardation at boundary surfaces, influence of boundary surface, diffusion and passage through the boundary surface, and diffusion through a number of layers of equal thickness. Water permeability was measured by Hoekstra's method with some modifications. Thus metal cells were substituted for porcelain crucibles; a circulating system was employed also in some tests. These water-vapor permeabilities (g./cm. hr. mm.) were found at 25° and 50° respectively: vinylidene chloride and vinyl chloride copolymer (Saran)  $3-4 \times 10^{-10}$ ,—; polyethylene (Alkathene, Imperial Chemical Industries)  $3.5 \times 10^{-9}$ ,—; chlorinated polyvinyl chloride (Vinifol, I. G. F.)  $6.0 \times 10^{-9}$ ,  $6.8 \times 10^{-9}$ ; polystyrene (Styroflex A, D. Seekabelwerke)  $3.7 \times 10^{-8}$ ,—; (Styroflex B)  $2.8 \times 10^{-8}$ ,  $3.1 \times 10^{-8}$ ; a plasticized polyvinyl chloride (Welvic, Imperial Chemical Industries)  $5.8 \times 10^{-8}$ ,  $1.1 \times 10^{-7}$ ; cellulose acetate (Triacetat, Schering)  $3.7 \times 10^{-7}$ ,  $4.0 \times 10^{-7}$ ; and cellulose acetate (Triafol, I. G. F.)  $4.4 \times 10^{-6}$ ,—. According to the results Saran and Alkathene are high in water-vapor impermeability. Doty's data for the permeation constants of Saran and Alkathene determined at 25° by McLeod-gage measurements of the permeated water vapor are somewhat lower and were  $0.3 \times 10^{-10}$  and  $0.6 \times 10^{-9}$ , respectively.

969. LAHEY, RICHARD W. Testing containers for moisture-vapor transmission. *Chem. Eng. News*, 22 (1944), p. 636, 638; *C.A.*, 38 (1944), 3167.

A review with recommendations for further work.

970. LARSTON, S., SR., and NASON, H. K. Effect of some environmental conditions on the permanence of cellulose—acetate and cellulose—nitrate sheet plastics. *Trans. Amer. Soc. Mech. Engrs.*, 67 (1945), pp. 259-266.

Cellulose-nitrate shown to be the least durable of the two. RLF

971. LIEBHAFSKY, H. A., MARSHALL, A. L., and VERHOEK, FRANK H. Loss of plasticizers from polyvinyl chloride plastics in vacuum. *Ind. Eng. Chem.*, 34 (1942), pp. 704-708; *C.A.*, 36 (1942), 7180.

Polyvinyl chloride plasticized with tritolyl phosphate, dibutyl phthalate or dibenzyl sebacate and molded was heated at 110-55° in vacuum and the volatile material was condensed in liquid N. The sample was suspended by a quartz spiral and the change in weight was estimated by readings with a cathetometer, which also determined the changes in dimensions. A trial determination of the rate of evaporation of the plasticizer from a container suspended like the sample showed the liquid to be at the same temperature as the surrounding bath and to evaporate irreversibly. The loss of plasticizer from the sample followed a relation derived from Fourier's equation until about 30 percent had evaporated, after which the concentration became increasingly less than required by the relation. This

deviation was partly due to decrease of the diffusion with plasticizer concentration. The change in volume of the sample corresponded to the liquid volume of the plasticizer lost. The contraction was isotropic. The fact that all three plasticizers behaved alike indicates that the forces holding them are physical (van der Waals), not chemical (valence).

972. MARGIVAL, F. Attempt to classify the methods of obtaining colored coatings. *Peintures, pigments, vernis*, 23 (1947), pp. 201–202; *C.A.*, 41 (1947), 7135.

Coatings are classified as follows: (1) Insoluble pigments are directly applied to a surface by friction (crayons, red pencil, pastel), by projection at elevated temperature (metal spraying), or over fresh plaster (fresco). (2) Insoluble pigments are applied incorporated into liquid binders, such as melted wax (encaustic), drying oil, and thinners (oil paints, enamels, printing inks), emulsified oil (tempera), solns. of cellulose derivs. (lacquers), or of rubber or synthetic resins (Alloprene, Duoprene, Pergut, Tegofan paints), aq. solns. of gums (aquarelle, gouache), caseinate (casein paint), gelatine (whitewash, water color, carbon paper), silicates (stereochromy), as well as in org. silicates, the sap of the lac tree (Japan lac), pitch or asphalt (bituminous paint). (3) Insoluble pigments are formed during or after application, as by  $\text{FeSO}_4$  or  $\text{K}_2\text{Cr}_2\text{O}_7$  on plaster or portland cement, by sulphides or chlorides on etched metal (patina), by plating with Ag, Au, Cu, Ni, Cr salts, or by decomposition of salts in light (photography). (4) Soluble pigments (dyes) are applied in a binder, such as resin solns. in alc. (spirit varnish, India ink), in turpentine, in drying oil (oleo-resinous varnish), nitrocellulose solutions (Zapon, lacquers), wax solns. (encaustic solns.), aqueous stains, or in complex still residues ("carbonyl"). (5) Soluble pigments in (wax) emulsions. (6) Soluble pigments in a melted binder, such as wax, or in metals (Sn, Zn).

973. MARK, HERMANN. Intermolecular forces and mechanical behavior of high polymers. *Ind. Eng. Chem.*, 34 (1942), pp. 1343–1348; *C.A.*, 37 (1943), 697.

A critical review and discussion of present knowledge. The highest average degrees of polymerization, i.e., of cellulose, rubber, gutta, and starch to be found in nature, are probably around 3000. Synthetic linear high polymers of degrees of polymerization of the same order of magnitude can be prepared without difficulty; in fact, degrees of polymerization up to 10,000 have been measured. To facilitate processing, these products must be degraded to lower degrees of polymerization and, in the form in which they are used in manufacturing, rubbers, plastics, and fibers have approximately the same degrees of polymerization. Furthermore, the distribution curves of these three materials are similar; the main differences are the forces between the chainlike molecules and the tendency to crystallize under the influence



of these forces. Whether a particular substance seems to behave at room temperature as a rubber, a plastic or a fiber depends chiefly on its tendency to crystallize and to remain crystalline. If the mutual attraction between chains is small, and if (or) the segments of these chains do not fit easily into a crystal lattice, the substance should be classed as a rubber. On the contrary, if the forces are strong and if (or) the chains crystallize readily, the substance should be classed as a fiber. An intermediate behavior signified a thermoplastic material. Tables show the relation between the properties and structure of high polymers, the effects of intermolecular forces on the mechanical properties of some high polymers, and the structures and mechanical behavior of some polyhydrocarbons. Seventy-three references.

974. Masterpieces in cast resin. *Pacific Plastics*, 6 (Sept. 1948), p. 41.

Brief description of method for reproducing metal engravings by cast phenolic resins. SR

975. MEYER, L. W. A., and GEARHART, W. M. Weather resistance of cellulose ester plastics compositions. *Ind. Eng. Chem.*, 37 (1945), pp. 232-239; *C.A.*, 39 (1945), 1780.

Plasticized panels of cellulose acetate butyrate (14 percent Ac; 37 percent Bu) and cellulose acetate (38.5 percent Ac) were subjected to standard weathering tests in Tennessee, Florida, and Arizona for 2 years. Two types of decomposition occurred, chain-length breakdown proportional to the amount of ultraviolet light and plasticizer leaching and volatilization. Phenyl salicylate (1 percent) inhibited decomposition by ultraviolet light and maintained the panel strength over 2 years, although the cellulose acetate compositions warped and crazed in 6-8 months. Nearly all unstabilized compositions were highly degraded in a few months in all locations. Plasticizers showed a small ultraviolet-inhibiting effect. Extensive graphs of data.

976. MORRELL, R. S., Editor. *Synthetic resins and allied plastics*. 3d ed. London, New York, Toronto, Oxford university press, 1951. 747 pp., illus., tables.

Contents: Ch. I. General introduction; Ch. V. Vinyl resins; Ch. VI. Acrylic resins; Ch. XIV. Shellac; Ch. XVIII. Methods of identification and testing of synthetic resins and other raw materials of plastics; Author index; Subject index. BMU

977. ŌTSUKI TORAO 大槻虎男. Inoculation experiments of moulds on the surface of various synthetic resin plates. *Sci. Pap. Japn. Antiques*, no. 2 (Oct. 1951), pp. 14-16.

Polyvinyl alcohol and acrylic resin were spread on glass plates and *Aspergillus glaucus* variety *tophilus* was inoculated on them. It grew on both resins. Formaldehyde-phenol type resin prevented the growth of the mould on it due to the formaldehyde contained as impurity. KY

978. PAPKOV, S. Structure of gels of high polymers. *Zhur. Fiz. Khimii*, 18 (1944), pp. 560-572; *Brit. Abs. A-I* (1946), p. 21; *Review*, 19 (1946), p. 166.

Gelation is basically identical with the formation of two layers in mixtures of partially miscible liquids; no two separate layers are formed only because of the high viscosity of one of the phases. Gelatin gel, e.g., consists of droplets of 0.2-0.5 percent gelatin solution embedded in approx. 50 percent gelatin. Drying of a gelatin gel causes shrinkage of the droplets, but their traces remain, and swelling of dried gelatin consists in expanding the holes left over and in filling them with the dilute gelatin solution. The dependence of swelling on the concentration of gelatin and the magnitude of the swelling pressure are explained from this point of view.

979. POWELL, G. M. Vinyl resins and the coatings industry. *Amer. Paint J.*, 35 (Aug. 6, 1951), pp. 32, 34, 36, 38, 40; (Aug. 13, 1951), pp. 62, 64, 66, 68, 70, 72.

This is an address in which is reviewed the amazing growth in the use of the vinyl coatings during the past 25 years. The vinyl plastics are recognized today as one of the important raw materials of the coatings industry. Technically, any polymeric resin can be classified as a vinyl resin if it is prepared by the polymerization of a vinyl group,  $\text{CH}_2=\text{CHX}$ , where X can be almost anything. Hence, one can classify polystyrene, polyethylene, and the acrylic, methacrylic and allylic resins as "vinyls" but the term is usually limited to vinyl chloride and vinyl acetate-polymers and copolymers. For commercial coatings the copolymer resin of vinyl chloride and vinyl acetate has been most successful, because it does not have the "horniness" and low solubility of the former or the low softening point of the latter. Methyl isobutyl ketone solvent has been especially developed for applying these resins in coatings. The copolymer coating resins can be modified with carboxyl and hydroxyl groups which improve their adhesion to metals and their compatibility with other resins. Vinyl acetate has some unique properties which commend it, especially its clarity, solubility and stability, but it is deficient in water resistance and tends to be soft, so it is used only to a minor extent as a coating material. It is used primarily for adhesives. Its derivative, polyvinyl butyrol, has many uses, especially for "wash primers" for coating ship-bottoms and other water-immersed surfaces and for outdoor structures. Resins with special properties are being developed all the time. Vinyl dispersions or emulsions in water have found many uses, both as coatings and adhesives. There are four types of dispersions: the organosols, the plastisols, the latices and the hydrosols. In organosols the suspending phase consists in part of volatile organic liquids. Plastisols are suspensions of finely divided resin in liquid plasticizers and they contain no volatile materials. Latices are aqueous dispersions of resins made by emulsion polymerization. Hydrosols are prepared by dispersing dry resin powders in water. Vinyl dispersions have the

advantage that the resins can have as high molecular weight as is necessary for desirable film properties, like hardness, toughness, and insolubility, without imposing considerations of solubility and solution viscosity as is often necessary in organic solvent resin solutions. Dispersions tend to give tougher films. They represent a distinct trend away from coating vehicles, which change chemically after application to materials which are manufactured under carefully controlled conditions to the high molecular weights products desired in the final film. RJG

980. PRICHETT, WILLIAM KENDRICK. Liquid rubber for Greek epigraphy. *Amer. J. Archaeol.*, 56 (1952), pp. 118-120.

Detailed directions are given for making casts of ancient inscriptions on stone with rubber latex. Latex has the following advantages over paper squeezes that were formerly used for this purpose: (1) easier to apply, being nearly foolproof; (2) gives a more accurate copy; (3) requires less equipment; (4) latex squeeze is easier to handle and to carry around; (5) is tougher; (6) impressions may be made of joining fragments in such a way as to illustrate their original positions; (7) when thinly applied is translucent making it easy to read when held to the light. Disadvantages are: drying process is longer so that the paper and the latex cannot be used on a friable surface. RJG

981. PRITCHETT, WILLIAM KENDRICK. Further notes on liquid rubber. *Amer. J. Archaeol.*, 57 (1953), pp. 197-198.

Improved methods are described for making latex impressions (squeezes) of Greek inscriptions on stone. Three thin coats are used instead of a single thick coat; the surface of the finished squeeze is dusted with corn starch before pulling. This reduces the adhesive character of the latex and prolongs the life of the squeeze. RJG

982. PURVES, P. E. Ultraviolet radiation in the polymerization of methyl methacrylate for museum exhibition. *M.J.*, 47 (1947), pp. 144-148.

Methyl methacrylate is useful for making transparent plastic mounts. Directions are given for removing the inhibitor from the monomer, for carrying out polymerization, for preliminary treatment of specimens (plant and zoological) and for preparation of moulds. Polymerization with ultraviolet light is preferred because there is less tendency for bubble formation than with heat. RJG

983. PURVES, P. E., and MARTIN, R. S. J. Some developments in the use of plastics in museum technology. *M.J.*, 49 (1950), pp. 293-296.

Describes the use of "Marco resins" for embedding and for injecting objects. IG

984. ROBINSON, COMMAR. Diffusion and swelling of high polymers. II. The orientation of polymer molecules which accompanies unidirec-

tional diffusion. *Trans. Faraday Soc.*, 42 B (1946), pp. 12-17; discussion pp. 29-33; *C.A.*, 42 (1948), 8520e.

If the swelling of a high polymer involves the movement of the swollen system as a whole (cf. *C.A.*, 42 (1948), 8520b) it can be expected that unidirectional swelling will be accompanied by stretching and partial orientation of the polymer. This effect could be demonstrated in experiments in which the swelling of cellulose acetate in either Me Et ketone or acetone was restricted to one direction by glass walls. The stretching was measured by means of inert foreign particles suspended in the polymer in the form of a scale; and the orientation was measured by determining on the stage of a polarizing microscope, the double refraction accompanying the diffusion. Since the observed double refraction was found to be proportional to the thickness of the sheets, it cannot be caused by a shearing effect but must be the direct consequence of the stretching. On account of relaxation of orientation taking place in the more dilute solution, the maximum of double refraction failed to coincide with the maximum of swelling, and the double refraction was found to fall increasingly below the value expected from the degree of swelling. Experiments with mechanical prestretched specimens indicated that the effects of diffusion and initial orientation were not purely additive.

985. RUDD, H. W., and TYSALL, L. A. The evaporation process in lacquer film formation. *J. Oil Col.*, 32 (1949), pp. 546-563; *C.A.*, 44 (1950), 3268.

The first two methods described for determining the evaporation rates of solvents employs the "Shell evaporimeter" and is suitable for routine evaluation; the second allows full examination of solvent loss from resin films at all stages of the process and can be used to investigate the effect of several variables on the rate of solvent evaporation. Results are presented to show the effects which variations in relative humidity, air flow, sample weight, and characteristics of the surface from which evaporation takes place have been on the evaporation rate of some solvents. The evaporation behavior of solvent mixtures is briefly discussed.

986. SARSFIELD, N. F. Principles of film formation; polyvinyl chloride dispersions as film-forming media. *J. Oil Col.*, 32 (1949), pp. 530-554.

Processes of film formation are: A. Varnish: Chemical reaction occurs after application; evaporation of solvent may also be involved. B. Lacquer: Evaporation of solvent only. C. Aqueous dispersions: Evaporation of immiscible phase. D. Fusion processes: scintering—partial fusion of solid particles; hot spraying of powders—total or partial fusion of particles during spraying; melt coating—medium applied as liquid; solidification occurs on cooling. E. Dispersion coating: particles are dispersed in a liquid which is absorbed at elevated temperatures to form a gel. Discussion of each process. RJG



987. SCHILDKNECHT, CALVIN EVERETT. *Vinyl and related polymers*. Their preparation, properties, and application in rubbers, plastics, fibers, and in medical and industrial arts. New York, John Wiley & sons, inc.; London, Chapman & Hall, Ltd., 1952. 723 pp., illus., tables.

Contents: Preface; Styrene polymerization; Styrene copolymerization; Styrene derivative and related polymers; Methacrylic and acrylic ester polymers; Acrylonitrile, Acrylic acid and related polymers; Polymers from vinyl acetate and related monomers; Vinyl chloride polymers; Vinylidene chloride and fluorovinyl polymers; Ethylene high polymers and copolymers; High polymers and copolymers of isobutylene; Vinyl ether polymers; Sulfur-vinyl compounds; Nitrogen-vinyl polymers; Vinyl ketone and miscellaneous polymers; Appendix; Index.

Reviewed in: *Chem. Eng. News*, 30 (July 7, 1952), p. 2840, by Raymond M. Fuoss; *Library J.*, 77 (1952), p. 724; *N. Y. New Tech. Bks.*, 37 (1952), p. 47; *U. S. Quat. Bk. Rev.*, 8 (Je. 1952), p. 217.

BMU

988. SCOFIELD, FRANCIS. Resin index of 1950. *Nat. Paint, Varnish, Lacquer Assoc., Sci. Sec. Cir.* no. 738, pp. 53-150.

This circular contains technical information and data furnished by manufacturers on about 1,350 synthetic and modified natural resins used by the paint, varnish and lacquer industries. The resins are classified in groups like alkyd, vinyl, acrylic, etc. For each resin is listed its trade name or designation, its producer and its properties like viscosity, solubility, and acid number.

RJG

989. SEYMOUR, R. B., and BARNUM, I. Surface reactions of copolymers. *Ind. Eng. Chem.*, 41 (1949), p. 1479.

Copolymers of methyl methacrylate and methacrylic acid copolymers form harder and more mar-resistant resins than polymethyl methacrylate. Copolymers containing up to 60 percent acrylic and methacrylic acid are insoluble in water. The ester groups in polymethyl methacrylate will react with aqueous potassium hydroxide at room temperature. "Salts" may then be prepared with various metallic ions. Some ions color the resin. Several increase the hardness and otherwise alter the physical properties of the resin.

RLF

990. SHAW, T. P. GLADSTONE. Systematic procedure for identification of synthetic resins and plastics. *Ind. Eng. Chem., Anal. Ed.*, 16 (1944), pp. 541-549; *C.A.*, 38 (1944), 6006.

The resin is isolated in a pure condition by its separation from solvents, plasticizers, fillers, pigments and dyes, followed by separation of mixtures into individual resins. Identification is done by separation into groups by reaction of halogens, N, S, saponification number, acid number. If halogens are present, consecutive solubilities in ligroin, hot acetone, ethyl acetate and ethylene dichloride are tested; this is followed, if necessary, by consecutive solubilities in

pyridine, tetrachloroethane and morpholine. When N or S is present, consecutive solubilities are tried in ethanol, acetone, ether, ethyl acetate, dioxane, pyridine, acetic acid,  $\text{CCl}_4$ ,  $\text{CHCl}_2\text{CHCl}_2$ ,  $\text{C}_6\text{H}_6$ , and hot water. If S and N are both present, 10 percent NaOH is tried before the addition of hot water. All the resins are further separated by odor on ignition, carbonate fusion, reactions of Liebermann-Storch, carboxylic acids, formaldehyde, acetates, acid number, saponification number,  $n$  and specific gravity. Shaw also classifies the common resins according to types and general reactions. The scheme will not distinguish between different degrees of polymerization.

991. SIMRIL, V. L., and HERSHBERGER, A. Permeability of polymeric films to organic vapors. *Mod. Plastics*, 27, no. 10 (1950), pp. 97, 98, 100, 102, 105-107, 154, 156, 158.

The permeabilities of 16 polymeric films to organic vapors are reported in terms of the permeability constant  $P^*$ . The effects on permeation rates of film and vapor structure and properties are discussed and related to the general theory of permeation advanced previously by other workers. It is shown that the least permeable polymers are those whose molecular structure is such as to permit close packing and strong intermolecular bonding and whose adsorption, or solution, of vapor is low. The presence of bulky side chains and the introduction of plasticizers increase permeability in general. The effects of temperature and film thickness are also discussed in the light of polymer and vapor characteristics. The data presented here strongly suggest the possibility of tailor-making films to yield any degree of permeability to any organic vapor. Author's abstract

992. SIMRIL, V. L., and HERSHBERGER, A. Permeability of polymeric films to gases. *Mod. Plastics*, 27, no. 11 (1950), pp. 95-96, 98, 100, 102.

The permeabilities of 21 polymeric films to oxygen, hydrogen, carbon dioxide, nitrogen, ammonia, hydrogen sulphide, and sulphur dioxide, both dry and moist, were studied. The data are presented in terms of a permeability constant  $P^*$  and are interpreted in terms of the structures and physical properties of the films and the gases. In general, it may be said that gas permeation increases with any decrease in the bonding forces between the polymer molecules of the film and with any increase in the attractive forces between film and gas. . . . Author's abstract

993. SMITH, W. T. Suggested method for predicting check resistance of lacquer films. *Trans. Amer. Soc. Mech. Engrs.*, 72 (1950), pp. 167-173.

Method is proposed using a Model C Mullen Tester. Influence of film thickness, moisture content, hardness and retained solvent on brittleness is discussed. RLF

994. STANTON, G. W., and HENSON, W. A. Saran coating latex. *Ind. Eng. Chem.*, 38 (1946), pp. 468-472; *C.A.*, 40 (1946), 3921.

The preparation, physical properties, and applications of Saran latexes (colloidal dispersions of polyvinylidene chloride polymers in water) are described. They are easily applied as coatings to paper, cloth, leather, plastics, etc., and dry rapidly; the resulting coatings are characterized by high luster, clarity, toughness, unrestricted choice of color, and high resistance to water, oils, acids, alkalis, and organic solvents. As aqueous dispersions, the particle size is uniformly in the range of 0.08-0.15 micron. Uniform size and distribution are still maintained at concentrations as high as 60 percent solids. The sensitivity to various substances, and the additions of various compounding ingredients are described.

995. STEVENS, W. C., and JOHNSTON, D. D. *Tests to investigate the efficacy of various coatings and coverings applied to the backs of painted panels with a view to reducing distortions following changes in atmospheric conditions*. London, 1950. (Gt. Brit. F.P.R.L.)

Typed report. These tests, made at the request of the National Gallery, London, were planned to extend preliminary data from similar investigations in 1931. Though still exploratory in nature the tests confirmed the previous observation that in thin panels, the gesso coating may be a factor inhibiting normal shrinkage. Of the various coatings tested in varying humidities, coatings of hot wax, polyvinylidene chloride, coverings of sheet polyethylene were most efficient in the increasing order given.

RDB

996. THOMAS, A. M., and GENT, W. L. Permeation and sorption of water vapour in varnish films. *Proc. Phys. Soc.*, 57 (1945), pp. 324-349; *B.P.V.*, 18 (1945), 246; *Abstract Review*, no. 111 (1946), p. 58.

An experimental investigation on the moisture permeability and sorption of detached varnish and polystyrene is described. Details for preparation of samples and method of test are given. Results for hydrogen and carbon dioxide permeability are also reported. The experimental results can be interpreted by assuming that the diffusion process is analogous to that of substances in solution. The effect of structure on diffusion and the relationship of the results to electrical insulation problems are considered.

997. TICHENOR, R. L. The photochemical decomposition of cellulose acetate-butyrate. *J. Polymer Sci.*, 1 (1946), pp. 217-224.

Chief result of irradiation is lowering of molecular weight. Ultra-violet light of shorter wavelengths than 3500 Å necessary for appreciable reaction. (Technical report on durability of modern plastic-sheeting.)

RLF

998. WHITBY, G. S. Polymerization—a great field of chemistry ahead. *Chem. Eng. News*, 22 (1944), pp. 1570-1575, 1612; *C.A.*, 38 (1944), 6426.

An address.

999. WORNUM, W. ESMOND. The blooming of varnish films. *J. Oil Col.*, 29 (1946), pp. 221–228.

A review of the work of Adam & Morrell (*J. Soc. Chem. Ind.*, 53 (1934), p. 225) on *crystalline bloom* and of New (*Paint Res. Assoc. Tech. Paper*, no. 7, 1929) on *crater bloom* is followed by a discussion of the significance of polar groups in the varnish in producing *syneresis bloom* and *wrinkle bloom*.  
SRJ

## Q. WAXES

1000. BENNETT, HARRY. *Commercial waxes; natural and synthetic, including properties, uses, methods of handling and formulas for making commercial wax compositions—a symposium and compilation*. Brooklyn, N. Y., Chemical publishing co., 1944. 583 pp., illus., tables.

Contents: Preface; Introduction; Abbreviations; Natural waxes; Manufactured and synthetic; Physical properties of waxes and wax compositions; Wax technology; Waxes in industry; Tables and glossary; Wax formulary; Appendix; Index.

Reviewed in: *Chem. Eng. News*, 23 (1945), p. 402; *Review*, no. 111 p. 179; *Chem. Met. Eng.*, 52 (1945), p. 263; *Library J.*, 70 (1945), p. 118; *N. Y. New Tech. Bks.*, 30 (Ja. 1945), p. 14; *Special Libraries*, 36 (1945), p. 63; *U. S. Quat. Bk. Rev.*, 1 (Mar. 1945), p. 56. BMU

1001. KNAGGS, NELSON S. *Adventures in man's first plastic; the romance of natural waxes*. New York, Reinhold publishing corporation, 1947. 329 pp., illus.

Contents: Foreword, by Walter J. Murphy; Introduction; Acknowledgments; Expedition to the Amazon; Wax through the ages; Exploring the Big Bend; On to Mexico; Submarine treasure; The little lady lac bug; *Chin-lu* and the wax caravan; *Ouricuri*, the ant killer tree; The Esparto harvesters of North America; The mysterious bee, famine fighter of mankind; A 60,000,000-year-old plastic; Wax from an ancient forest; White crystals from black gold; Miscellaneous waxes; Technical reference section (properties of waxes—bibliography); Index.

Reviewed in: *U. S. Quat. Bk. Rev.*, 3 (1947), p. 318. BMU

1002. KNAGGS, NELSON S. Carnauba—Brazil's tree of life. *Chem. Eng. News*, 22 (1944), pp. 1564–1567.

This is a well-illustrated description of the occurrence of the carnauba palm in northwestern Brazil and the harvesting, crude refining, and grading of carnauba wax obtained from it.  
RJG



1003. MCCLELLAND, C. P., and BATEMAN, R. L. Technology of the polyethylene glycols and Carbowax compounds. *Chem. Eng. News*, 23 (1945), pp. 247-251; *C.A.*, 39 (1945), 1707.

The Carbowax compounds (solid polyethylene glycols, mol. wt. 1000-7000) and the liquid polyethylene glycols (mol. wt. 200-1000) fill an industrial need for water-soluble unctuous compounds and are available commercially in various molecular-weight ranges. Melting point, flash point, specific gravity, viscosity and aqueous solubilizing action all increase with increasing molecular weight. Water solubility, vapor pressure, hygroscopicity and solubility in organic solvents generally decrease with increasing molecular weight. Phase diagrams are given for Carbowax compounds and water. Solubilities in various solvents and compatibilities with various organic materials are measured. Some industrial uses are as bases in ointments and cosmetics, as pigment binders and spreaders in coatings such as water paints, as plasticizers, as humectants, as special washable lubricants, as binders for ceramic pigments, as dispersing agents, and as sizing material.

1004. SCHEIBER, J. Nature of the "waxy" state. *Farbe u. Lack*, 55 (1949), pp. 69-73; *B.V.P.*, 23 (1950), p. 25; *Abstract Review*, no. 161 (1950), p. 185.

The physical properties that characterize a wax and differentiate it from a fat or a resin are attributed to semicrystalline structure described as a "crystal gel," on the grounds of solubility and compatibility phenomena described.

1005. TAUBE, E. Carnauba wax. *Econ. Botany*, 6 (1952), p. 379; *J. Amer. Oil Chem. Assoc.*, 30 (1953), p. 95.

A discussion of the history, source, processing, and uses of carnauba wax. AEW

## R. SOLVENTS AND DETERGENTS

1006. American standards association. *Allowable concentration of toluene*. New York, 1943. 8 pp. (American Standards Association Z 37.12-1943.)

The maximum allowable concentration of toluene (toluol) is 200 parts per 1,000,000 parts of air by volume, corresponding to 0.752 mg. per liter at 25°C. and 760 mm. pressures for exposures not exceeding a total of 8 hours daily. This applies to all places of employment. Sampling procedure and analytical methods are given. RJG

1007. AMOR, ARTHUR J. The toxicity of solvents. I-II. *Paint Mfg.*, 20 (1950), pp. 53-58, 89-93. *C.A.*, 44 (1950), 4165c.

Notes and tables on the toxicity of industrial solvents are given. I covers physiological action, anesthetics and irritants, groups of solvents, alcohols, amides, esters, ethers, and furans. II covers glycols, halogenated compounds, hydrocarbons, ketones, nitriles, nitrohydrocarbons and carbon disulphide.

1008. CURTIS, RALPH J., SCHEIBL, R., and BRADLEY, THEODORE E. Thin film evaporation vs. evaporation of bulk liquids and instruments for their measurement. *Anal. Chem.*, 22 (1950), pp. 538-545, figs.

New equipment has been devised to measure the evaporation rates of thin films from relatively large surface areas. This Shell evaporimeter is a modified Jolly balance with quartz-fiber springs and it employs filter paper cones in place of non-porous metal pans. The work shows that at atmospheric humidity, the nature of surfaces from which liquids are permitted to evaporate and the chemical constitution of solvents and solutes are significant factors, which often assume greater importance in thin film evaporation than in the evaporation of bulk liquids. This work (done in the Shell Development & Co., Emeryville, Calif.) aims to standardize evaporation rate measurements and the means of reporting them. RJG

1009. DELMONTE, JOHN. Effect of solvents upon solid organic plastics. *Ind. Eng. Chem.*, 34 (1942), pp. 764-770; *C.A.*, 36 (1942), 4222.

The resistance to shear, as determined by the punch test, was used as a measure of solvent action. Strips of plastics were immersed in various solvents for different lengths of time and the load necessary to produce failure was determined before and after. An equation expresses the solvent power of an organic solvent on a plastic by  $S = (K/R)e^{-t/xR}$  where  $K$  is a constant for a given solvent on all types of plastics,  $R$  is resistance to penetration,  $t$  is time and  $x$  is thickness. Data are given for 14 solvents on cellulose acetate, cellulose nitrate, cellulose acetate-butyrate, polyvinyl chloride acetate, polystyrene, and polymethyl methacrylate.

1010. DOOLITTLE, ARTHUR K. Mechanism of solvent action. *Ind. Eng. Chem.*, 36 (1944), pp. 239-244; *C.A.*, 38 (1944), 1676.

In solution of resinous substances there are equilibria of solvation-desolvation and aggregation-disaggregation. Desolvation rate is fixed at constant temperature, whereas rate of solvation is a function of solvent concentration. As a homologous series of solvents is ascended, the threshold concentration necessary to initiate the solution process diminishes to a constant minimum, which is independent of the diluent and can be used as reference standard for a given resin. The second equilibrium depends upon the first. In fluid solutions the

aggregation extent rises linearly with solvent concentration decrease, but at the threshold value, desolvation allows aggregation at multiple points of contact, resulting in gelation or precipitation. In film formation the high viscosity obstructs the tendency of molecules to unite with one another at the maximum number of points of contact; this results in an extended structure. Plasticization prevents complete desolvation of resin with similar effect. Data are given for nitrocellulose and vinylite resins.

1011. DOOLITTLE, ARTHUR K. Mechanism of solvent action; influence of molecular size and shape on temperature dependence of solvent ability. *Ind. Eng. Chem.*, 38 (1946), pp. 535-540; *C.A.*, 40 (1946), 4585.

The threshold concentration for solvation was measured at different temps. between  $-10^{\circ}$  and  $50^{\circ}$  for numerous homologous series of solvents. The temperature coefficient of solvent ability is defined as the negative of the mean fractional change in threshold concn. per degree over the range  $-10^{\circ}$  to  $50^{\circ}$ . Temperature dependence of solvent ability in homologous series of solvents is influenced by the mol. wt. Members of low mol. wt. generally have a positive temperature coefficient of solvent ability, whereas high-mol.-wt. members exhibit a negative temperature coefficient of solvent ability. The temp. dependence of solvent ability is influenced more by the shape of the solvent mol. than by its wt. The most compact shape has a pos. temp. coeff., whereas a more extended structure exhibits a neg. temp. coeff. This inversion is greater with branching and increases with the extension of the branches. In linear mols. contg. multiple solvating groups, the inversion is greater the farther the active groups are from the ends of the mol. With solvents showing a pos. temp. coeff. of solvent ability, gels of macromol. substances that liquefy on heating can be prep'd.; whereas with solvents exhibiting a neg. temp. coeff. of solvent ability similar gels that liquefy on cooling can be prep'd. To prep. a gel that liquefies on cooling the solvent must actively solvate the resinous substance in addn. to having a neg. temp. coeff. of solvent ability over the desired temperature range. In general, linear solvent mols. are more effective in promoting an abrupt sol-gel transformation than branched mos., although the latter may often show a greater negative temperature coefficient of solvent ability.

1012. DRINKER, PHILIP, and COOK, WARREN A. Maximum allowable concentrations of atmospheric impurities. *J. Indus. Hyg. Toxicol.*, 31 (1949), pp. 51-53.

Suggested as practical working limits: Concentration from 500-2500 p.p.m. (examples: acetone, gasoline, ethyl ether, ethyl chloride, ethyl alcohol); 100-500 p.p.m. (methyl alcohol, toluene, methyl ethyl ketone, trichlorethane); 20-100 p.p.m. (benzene, butanol, carbon tetrachloride; carbon monoxide); 2-20 p.p.m. (hydrogen sulphide, carbon

disulphide, tetrachloroethane, hydrochloric acid, hydrocyanic acid); 0.1-2 p.p.m. (chlorine, phosgene, arsine, dimethyl sulphate); below 0.1 p.p.m. (radioactive gases). RJG

1013. DURRANS, THOMAS H. *Solvents*. 6th ed. rev. & enl. London, Chapman & Hall, Ltd., 1950. 257 pp.

Contents: Introduction; Part I: Solvent action; Solvent power; Plasticising solvents; Solvent balance; Viscosity; Vapor pressure; Inflammability; Toxicity. Part II: Introduction; Hydrocarbons and sundry solvents, nitroparaffins; Alcohols and their ethers; Ketones; Esters; Glycols and their ethers; Cyclohexane derivatives; Chloro-compounds; Furanes; Plasticising solvents; Appendix: Trade names; Solubility tables; Plasticiser proportions; Index. LB

1014. FORBES, ROBERT JAMES. *La distillation à travers les âges*. Conférence. Société belge pour l'étude du pétrole, 1947. 12 pp., 21 illus.

Bref aperçu historique.

RL

1015. FORBES, ROBERT JAMES. *Short history of the art of distillation from the beginnings up to the death of Cellier Blumenthal*. Leiden, E. J. Brill, 1948. 405 pp., illus., maps.

Contents: Introduction; The Alexandrian chemists; The Arabs; The Middle Ages; From Brunschwygk to Boyle; From Boyle to Lavoisier; The wedding of spirit and science; New vessels for old; The aftermath; Bibliography (673 references); Indexes.

Reviewed in: *J. Chem. Educ.*, 26 (1949), p. 343; *Conservation*, 1 (1952/54), p. 94, by A. E. A. Werner. BMU

1016. HEMEON, W. C. L. Ventilation requirements for industrial solvents. I. Dilution rates of vapor. *Heating & ventilating*, 42 (Dec. 1945), pp. 95-98.

In tables gives maximum allowable concentration of a number of toxic solvent vapors. II. Convectional dispersion. *Ibid.*, 43 (Jan. 1946), pp. 69-73. Considers the removal of toxic vapors from bench tops. Fundamental engineering data for ventilation design. III. Designing local exhaust for solvents. *Ibid.*, 43 (Mar. 1946), pp. 83-86. It is shown how standard dilution rates are employed in the design of hoods and booths. IV. Industrial applications of the dilution principles. *Ibid.*, 43 (Apr. 1946), pp. 79-81. The fundamental principles described in the preceding articles are applied to various kinds of sheet rubber cementing operations and similar processes where a solvent may evaporate into the working atmosphere. RJG

1017. MCGILL, C. M. Death and illness from the use of carbon tetrachloride. *Northwest Med.*, 45 (1946), p. 169; *Brit. J. Ind. Med.*, 4 (1947), p. 68; *C.A.*, 42 (1948), 2035.

Six cases of  $\text{CCl}_4$  poisoning which occurred from using this substance without adequate safety precautions are described. With the



possible exception of benzene,  $\text{CCl}_4$  is the most toxic solvent used in industry and produces acute hemorrhagic nephritis and toxic hepatitis, usually by inhalation. Being an excellent solvent with noninflammatory properties, it tends to be used too often both in industry and in the home without appreciation of its dangers. A reminder is given to physicians assocd. with industries of their responsibility in the education of employers.

1018. MELLAN, IBERT. *Industrial solvents*. 2d ed. New York, Reinhold pub. co., 1950. 764 pp. illus.

Contents: The nature of solution; Solvents, latent solvents, non-solvents; Vapor pressure, evaporation rate, boiling point; Viscosity; The industrial application of solvents; Safe handling of solvents; Hydrocarbon solvents; Halogenated hydrocarbons; Nitroparaffins; Amines; Alcohols; Furfural; Ketones; Acids; Ethers; Esters; Selected bibliography; Indexes.

Reviewed in: *Chem. Eng. News*, 29 (May 28, 1951), p. 2224.

BMU

1019. RIDER, D. K., and SUMNER, J. K. Oven for measurement of volatility of plasticizers in polyvinyl chloride and chloride-acetate copolymer compositions. *Ind. Eng. Chem., Anal. Ed.*, 17 (1945), pp. 730-733; *C.A.*, 40 (1946), 1350.

An oven is described using a stainless-steel, rotating, squirrel cage-type sample holder which always maintains the sampler in a vertical position. A test method consisting of heating for various periods of time is given; this method is capable of distinguishing between various plasticizers on the basis of small differences in volatility.

1020. Society of public analysts and other analytical chemists, London. Examination of detergent preparations. *Analyst*, 76 (1951), pp. 279-284.

The nature, composition, potency and other characteristics, as well as methods of analysis, of most commercial detergents are given, and some non-scientific terms, e.g., "active detergent" are discussed. LB

## S. MATERIALS AND METHODS OF EARLY PAINTING

1021. AUGUSTI, SELIM. *La tecnica dell' antica pittura parietale Pompeiana*. Napoli, G. Macchiaroli, 1950. 42 pp.

Reconstitution de la technique picturale pompéienne: composition et structure du "tectorium," de la "préparation" surjacente et de la

couche picturale. Elle peut-être considéré comme une "technique spéciale à la détrempe," le liant étant une "chaux saponifiée" (suspension aqueuse de chaux et savon, additionnée de cire). PC

1022. BONTINCK, ED. Fixatifs pour le pastel. *Chim. Peintures*, 7 (1944), pp. 151-158, illus.

The optical effects of fixatives in pastel surfaces are explained. Use of fixatives is traced back to the fifteenth century. Up to the middle nineteenth century no resins but only animal glues and vegetable gums were used. Shellac and casein fixatives were introduced in the middle nineteenth century. Now synthetic resins have taken their place. Thirty-one references. RJG

1023. BORRADAILE, VIOLA, and ROSAMUND. *The student's Cennini; a handbook for tempera painters*. Brighton, The Dolphin press, 1942. 39 pp., tables.

Contents: Foreword, by P. Tudor-Hart; Preface; How to paint in egg tempera; Grounds for egg tempera; The art of gilding; Supplementary workshop notes; Table of reference to Cennini's "Trattato." BMU

1024. BOSCH, LODEWYK. De geheimen van de gebroeders van Eyck. *Phoenix (Amsterdam)*, 1 (1947), pp. 23-26, 6 illus.

Généralités sur le liant des van Eyck. Les travaux de Ziloty. PC

1025. BREITINGER, E. O. Mittelalterliche Malgründe der Tafelmalerei. *Dtsch. Z. Malt.*, 58 (1942), pp. 32-37, 56-59, 72-75.

Renseignements techniques trouvés dans les recettes du moyen-âge (Hermeneia, Théophile, Heraclius, Cennini) sur la préparation (colle et gypse) et le support (bois, toile) des tableaux anciens. PC

1026. BRYSON, H. COURTNEY. The earliest known paints. *Paint Mfg.*, 22 (1952), pp. 243-246, 257; *Abstract Review*, no. 182 (1952), p. 165.

Paintings on the roof of a cave in Altamira in North Spain and on the walls of grottoes in the Dordogne in central France are estimated as being 20,000 years old. The materials used in the limestone cave at Altamira include Spanish red oxide, ochers, and charcoal with likely binding media of blood serum, milk, or animal fat. Some of the outlines have a feathered edge. One possible hypothesis is that the dry powder was blown on to the outline by means of tubes, the medium having been previously applied. The use of the paintings in sympathetic magic is discussed.

1027. CARSON, MARIAN SADTLER. Early American water color painting. *Antiques*, 59 (1951), pp. 54-56.

A brief account is given of the early history of water-color painting in America. A few early colormen are listed, beginning with John

Smibert's advertisement of "all sorts of colours, dry or ground" in 1734. Although imported manuals of water-color painting were advertised as early as 1761, the first American volume appeared in 1815 and was entitled "The Art of Coloring and Painting Landscapes in Water Colours, accompanied with Ten Engravings Selected from the best Masters on these Subjects by an Amateur, Fielding Lewis, Jr." Many of the early painters in oil also used water color. EHJ

1028. CAGIANO DE AZEVEDO, MICHELANGELO. Una lapide funeraria dipinta ad encausto. *Boll. ist. centrale restauro*, 7-8 (1951), pp. 5-9.

L'étude des restes d'une peinture à l'encaustique datant du 1er siècle A.C. FD

- 1028a. CHANDRA, MOTI. *The technique of Mughal painting*. Lucknow, U. P. Historical Society, Provincial Museum, 1949. xi, 108 pp., 10 pls.

Contents: Foreword; Preface; Introduction; Ground and carriers; Pigments and binding media; Crayon and brush; Method of painting; Perspective, shading and landscape; Stances and proportion; Decoration and border; The artist, the pupil, and the workshop; Faked pictures; Historical retrospective; Index. BMU

1029. COCHE DE LA FERTÉ, E. *Les portraits Romano-Egyptiens du Louvre*. Paris, Musées nationaux, 1952. 31 pp., 25 pl.

Détails sur la technique picturale. Trois analyses chimiques de liants et pigments. PC

1030. COREMANS, PAUL, GETTENS, RUTHERFORD J., and THISSEN, JEAN. La technique des "Primitifs flammands"; étude scientifique des matériaux, de la structure et de la technique picturale. *Conservation*, 1 (Oct. 1952), pp. 1-29, pls.

This is a report (in French) of the technical examination of Bouts' altarpiece of the Last Supper (St. Peter's Church, Louvain), which is one of a series to be studied for identification of the materials, analysis of stratified structures and determination of the painting technique. The ground is made of chalk and animal glue and is separated from the paint by a thin unpigmented layer which appears to be a drying-oil film. The existence of minute fossil forms of marine algae of the family Coccolithophoridae was observed in the chalk; their presence may be significant in connection with the geographical origin of the chalk. The various paint layers in the design are well defined. Several photomicrographs and diagrams of paint cross sections are shown. The medium in all paint structures appears to be drying oil or at least to have a drying oil base. There is no evidence of tempera even in the under painting. No evidence was found either to support or to disprove the emulsion theory. The materials of the colors are: violet—glaze of madder red over or mixed with azurite and white lead; green—copper resinate and malachite; canary yellow—tin-lead

oxides; red—vermilion (mercuric sulphide), ochre (iron oxide), and madder; brown—mixture of black, red and green pigments; white—white lead; flesh tone—white lead tinted with vermilion; black, probably bone black; gray—white lead mixed with black and other pigments. Microchemical tests used in the identification of pigments and mediums are charted. RJG

1031. CRIVELLI, E. The origins of pigment and varnish techniques. *Ind. Vernice*, 5 (1951), pp. 134–138; *C.A.*, 46 (1952), 275; *Abstract Review*, no. 177 (1952), p. 52.

A survey of the development of colors, coatings, etc., from ancient times.

1032. FRANKE, HERBERT. Two Yüan treatises on the technique of portrait painting. *O.A.*, 3 (1950), pp. 27–32.

A translation is made of *Secrets of portrait painting*, by Wang I, preserved in T'ao Tsung-i's *Cho-kêng lu*, which was published in 1366. In the treatise the artist not only gives directions for posing the sitter and executing the portrait but he also tells exactly what colors to use for different parts of the physiognomy and how to mix colors to produce different tones and shades. The list of basic colors at the end of the treatise seems to be arranged in systematic order beginning with the darkest shades. The translator points out the difficulty of giving correct interpretation to the numerous technical terms. Many terms of the Yüan period seem to have become obsolete among later painters. RJG

1033. FUKUYAMA TOSHIO, 福山敏男 and AKIYAMA TERUKAZU, 秋山光和 Editors. *Eizanji Hakkakudō no kenkyū*, 榮山寺八角堂ノ研究. Study on the Octagonal Hall of the Eizanji temple. Kyoto, Benridō Co., 1951. 108 pp. with 12 plates. Summary in English. Illus.

Contents: History; Construction of octagonal hall; Ornamental paintings. Addenda: Pigments used in the decorations (Kazuo Yamasaki); Reconstruction of the octagonal hall (Kiyoshi Asano); References. KY

1034. GETTENS, RUTHERFORD J., and TURNER, EVAN H. The materials and methods of some religious paintings of early 19th century New Mexico. *Palacio*, 58 (1951), pp. 3–16.

The small religious paintings of New Mexico called "santos" were usually done on wood panels in aqueous medium over gesso grounds. Pigments identified on 13 panels are as follows: Red: vermilion, most common; also red lead, iron oxide, and an organic red probably derived from the cochineal insect. Yellow: a faded organic yellow, not identified, most common, and also ochre. Green: indigo mixed with an apparently faded organic yellow; no copper greens were identified. Blue: indigo most common; also Prussian blue on 2 panels. Brown:



umberlike earth pigment; also carbonaceous brown. Black: carbon, both charcoal and lamp black. White: usually uncovered gesso background; white lead on one panel. It appears that the "santeros" employed chiefly colors imported from Mexico or by way of Mexico.

RJG

1035. GOMBRICH, E. H. The cleaning of pictures, etc. *Burl. Mag.*, 92 (1950), p. 209.

A quotation from Pliny's *Historia Naturalis* concerning Apelles' painting technique indicates the use of dark varnish "so that its brightness of the colours should not hurt the eyes." Postmedieval artists may have been influenced by this important account.

SRJ

1036. HAEBERLEIN, FRITZ. Deutsche Malregeln im 12. Jahrhundert. *Dtsch. Z. Mal.*, 58 (1942), pp. 15-20, 2 illus.

Reconstitution de la technique picturale ancienne. Exemple choisi: une miniature d'un Evangélaire de Westphalie, 12e s.

PC

1037. HILDBURGH, W. L. On some Italian Renaissance caskets with *pastiglia* decoration. *Ant. J.*, 26 (1946), pp. 123-137, illus.

Detailed description of methods of fabrication of wooden caskets which were applied with relief decoration. The *pastiglia* on some caskets is compounded with white lead and an animal binder, which resembles the whole of egg; on others gesso was used. Matrices were made of wood or hardened plastic material and in some instances apparently of metal.

IG

1038. KAHN, RAHIM BUX. Fresco paintings of Ajanta. *J. Oil Col.*, 32 (1949), pp. 24-31.

These paintings were executed during 200 B.C.-A.D. 600 on hard impervious rock faced first with a mud plaster prepared from ferruginous clay containing vegetable matter and then with a fine plaster of lime and gypsum. Pigments used included local ochres, siennas, umbers and terre verte, lamp black, and lapis lazuli. It is not clear what medium was used, but no trace of an organic binder could be found.

AEW

1039. KING, EDWARD S. Stuart's last portrait of Washington—its history and technique. *J. Walters Art Gallery*, 9 (1946), pp. 86-96.

The author discusses the chronology and subsequent history of Gilbert Stuart's three original portraits of Washington taken from life. The portrait subsequently purchased by the Boston Atheneum in 1831 was the most popular. Stuart himself copied it over 70 times and a large number of forgeries were made even during Stuart's lifetime. X-rays of the Atheneum portrait and of Stuart's last copy, now owned by the Walters Gallery, are compared with that of the "Etting" copy now owned by the Maryland Historical Society. The powerfully constructed form of the first two, strikingly revealed by their shadow-graphs, is not present in the third portrait which is not by Stuart.

EHJ

1040. KRONSTEIN, MAX. Ancient surface technology. *Amer. Paint J.*, 32 (1947), no. 8, pp. 39, 42-43, 46, 48, 51-52; no. 10, pp. 16, 18, 22, 24, 26-27; *Abstract Review*, no. 132 (1948), p. 36.

The history of painting by the Egyptians, Italians, etc., before the use of drying oils as vehicles is discussed, particularly as concerns tempera painting and wax vehicles.

1041. LAURIE, ARTHUR PILLANS. *The technique of the great painters*. London, Carroll and Nicholson Ltd., 1949. 192 pp., plates (part col.), illus.

Contents: Foreword; Painting in Egypt, Greece and Rome; Buon fresco in classical times; Buon fresco; Mediaeval pigments; Pigments described by Cennino Cennini; Painting with yolk of egg; Painting in drying oil; The building-up of a painting in the fourteenth and fifteenth centuries; Light; The Rokeby Venus; Brushwork; Mediaeval varnishes; The Persian illuminated Mss.; Forgeries; Emulsions and the Van Eyck medium; Index.

BMU

1042. MARGIVAL, F. The technique of paintings from antique to modern times. *Peintures, pigments, vernis*, 27 (1951), pp. 29-35; *Abstract Review*, no. 175 (Jan. 2, 1952).

Historical review with 24 references.

1043. MAROGER, JACQUES. *The secret formulas and techniques of the masters*. Tr. from the French by Eleanor Beckham. New York and London, The Studio publications, inc., c1948. 200 pp., plates.

Contents: Section 1: Introduction; On drawing; Encaustic painting; Theophilus, the Monk; The tempera technique; Van Eyck; An incident of the invention of Van Eyck (Printing); The first lead medium (Antonello da Messina); The second lead medium (Leonardo da Vinci); The lead and wax medium of the Venetians (Giorgione, Titian, Tintoretto); The High Renaissance (The results of technical development); Rubens; The Dutch masters (Rembrandt, Hals, and "The Little Masters"); Velasquez; The loss of the medium; Section 2: The formulas and technique of Van Eyck; The formula for the first lead medium (Antonello da Messina); The formula for the lead and wax mediums of the Venetians (Giorgione, Titian, Tintoretto); The lead and wax formula simplified; A summary of the formulas and technique of Rubens; The formulas of the Dutch Masters ("The Little Masters," Rembrandt); The formula of Velasquez; Section 3: The materials; Preparation of grounds; Bibliography; Index of artists quoted.

Reviewed in: *Library J.*, 74 (July 1949), p. 1029, by A. S. Plant; *New Republic*, 120 (Apr. 18, 1949), p. 28, by Lincoln Kirstein; *Sat. Rev. of Lit.*, 32 (May 7, 1949), p. 33, by L. R. Sander; *College Art J.*, 8 (1949), pp. 239-241, by James Watrous; *Mag. Art*, v. 42 (Nov. 1949), p. 273, by Ralph Mayer.

BMU

1044. MERRIFIELD, MARY PHILADELPHIA. *The art of fresco painting as practised by the old Italian and Spanish masters, with a preliminary inquiry into the nature of the colours used in fresco painting.* . . . A new illustrated edition with an introduction by A. C. Sewter. London, Alec Tiranti Ltd., 1952. 134 pp., pls.

Contents: Introduction by A. C. Sewter; An inquiry into the nature of the colours used in fresco painting by the Italian and Spanish masters: Preliminary observations—Red colours (Amatto)—Red colours (Sinopia)—Blue colours—Green colours—Black colours—White, yellow, and brown colours; Concluding remarks; The art of fresco painting: Pt. I. Directions and observations from various early writers: I. Vitruvius and Guevara. II. The Monk Theophilus. III. Leon Batista Alberti. IV. Cennino Cennini. V. Giorgio Vasari. VI. Raffaello Borghini. VII. Giovanni Batista Armenino. VIII. Andrea Pozzo. IX. Francisco Pacheco. X. Antonio Palomino. XI. John Martin. Pt. II. Extracts from various authors illustrative of the practice of fresco painting: I. Practice of Early Italian school. II. Of the painting. III. Colouring and colour. IV. Of the use of gold on frescoes. V. Instances of the durability of external frescoes. VI. Causes of the destruction of frescoes. VII. Of retouching, repairing, and cleaning frescoes. VIII. Of the repairs of the Gallery of Carracci in the Palazzo Farnese, and of the Loggia of Raffaello at the Lungara; Index. BMU

1045. MONTI, NICCOLA. Della pittura a fresco. *Boll. ist. centrale restauro*, 9-10 (1952), pp. 106-109.

Les différentes techniques de peinture "a fresco" et leur utilisation. FD

1046. Paints and receipts for wooden work. *Bull. Conn. Hist. Soc.*, 10 (Jan. 1943), pp. 9-16.

This is the title of a small account book which dates around 1800; it apparently belonged to an apprentice cabinetmaker who recorded information that his master taught him about preparing paints for furniture, especially chairs. These recipes can be useful to modern restorers of old cabinet work and furniture. Although the apprentice's notes are hardly literate and many of his terms are quaint or obscure in meaning, annotations drawn from various dictionaries make them understandable and usable. RJG

1047. PEASE, MURRAY, and STOUT, GEORGE L. Oil on canvas. *Art News*, 47 (May 1948), pp. 24-28, illus.

An analysis of the beginnings of modern painting in the seventeenth century. How the handling of paint changed under the brushes of El Greco and his contemporaries. RJG

1048. RUHEMANN, HELMUT. *Artist and craftsman; contrast, similarity, influence.* . . . New York, Chanticleer press inc., 1948. 80 pp. text, 68 illus. (8 in col.).

Contents: Differences; Similarities; Borderline cases; Collaborations; Mutual influences.

"Compares and contrasts the great art and the great craftsmanship of the ages. A valuable book . . . his illustrations open a rich field of enquiry." — *Liverpool Post*. RJG

1049. RUHEMANN, HELMUT, and KEMP, ELLEN. *The artist at work*. London, Penguin books Ltd., 1951, 72 pp., illus. (part col.). Another issue: Baltimore, Penguin books, 1952.

Contents: Introduction; Influences; Personality; The works of art; List of illustrations; Index of artists; Acknowledgements. RJG

1050. RUHEMANN, HELMUT. Discoveries beneath the paint of old masters. *Art News*, 50 (Feb. 1952), pp. 30–35, 54–55, illus.

A preview of the *Artist at Work*. RJG

1051. SCHMID, FREDERIC. *The practice of painting*. London, Faber and Faber Ltd., 1948. 125 pp., illus. of the palettes of many prominent painters.

Contents: The theory and practice of painting; The French academy and its school; The art of Holbein and the tradition in Northern Switzerland; The practice of painting in England; Water-colour books in England from 1750 to 1850; The earliest history of the colour wheel; Bibliography; Index. BMU

1052. SELDON, MARJORY WARD. *The interior paint of the Campbell-Whittlesey House, 1835–36*. Rochester, The Society for the preservation of landmarks in Western New York, 1949. 24 pp.

An investigation was made of the original interior paint coats; pigments identified were Prussian blue, yellow ochre, Paris green, sienna, and white lead. None of the tints could be reproduced with modern commercial ready-mixed paints. Library research turned up several interesting early works on the decorative painters art. The history of pigments and paints and early practices in varnishing, glazing, and graining are discussed. RJG

1053. SMITH, WATSON, and EWING, LOUIE. Objective description of the painted walls in the Jeddito; materials and methods employed in their construction. In their *Kiva mural decoration at Awatovi and Kawaika-a*. . . . Cambridge, Mass., 1952, pp. 13–32, illus., tables. (Papers Robt. S. Peabody Found. Archaeol., vol. 37).

This covers materials and structures of masonry and mortar; the analysis and source of constituents of plaster; renewal of plaster coats; identification of paint pigments; and the application of paints. RJG

1054. STOPPELAËRE, ALEXANDRE. Introduction à la peinture thébaine. *Valeurs*, nos. 7/8 (1947), pp. 3–13, 4 illus.

A few technical data on materials and technique of ancient Egyptian (Thebes) wall paintings. PC



1055. WULKAN, H. E. What do we know about the paints of the old Egyptians? *Verfkroniek*, 23 (1950), pp. 41-46; *Abstract Review*, no. 159 (1950), p. 135.

A historical survey with 19 references.

1056. ZILOTY, ALEXANDRE. *La découverte de Jean Van Eyck et l'évolution du procédé de la peinture à l'huile du moyen-âge à nos jours*. 2d ed. Paris, Librairie Floury, 1947. 277 pp. + 32 illus.

Contents: Preface; Technical introduction. Part I: The discovery of J. Van Eyck. General: The problems and the mediums; Written records from the XV to XVI cent.; The main hypothesis; The secondary hypothesis based on the use of essential oils. Part II. The evolution of the technique of oil painting since J. Van Eyck. Introduction; The end of the XV and the XVI cent.; The XVII cent.; The XVIII cent.; The XIX and XX cent.; Illustrations; Index. PC

#### T. ARTISTS' METHODS AND MATERIALS

1057. ASMUS, E. W. Titanium white for artists' oil color. *Tech. Mitt. Malerei*, 57 (1941), pp. 30-32; *C.A.*, 38 (1944), 1891; *Abstract Review*, no. 93 (1944), p. 110; *Chem. Zentr.*, Pt. 2 (1941), p. 1451.

TiO<sub>2</sub> alone is unsuitable for artists' oil color. Poppyseed-oil colors with TiO<sub>2</sub>-zinc white (1:1) show practically no yellowing in darkness, dry very slowly and have very high covering power with good package stability. Poppy-seed-oil colors with TiO<sub>2</sub>-Kremnitz white (1:1) yellow little in the dark and dry well.

1058. BLIESENER, PAUL. Artists' paints and their manufacture, and the products. *Seifen-Öle-Fette-Wächse*, 78 (1952), pp. 199-202; *C.A.*, 47 (1953), 6670f.

A review on the production and properties of oil paints, water colors, pastels, and colored chalks.

1059. BONTINCK, ED. De l'emploi des vessies à celui des tubes en étain pour la conservation des couleurs fines. *Chim. peintures*, 7 (1944), pp. 207-211.

A discussion of the history of prepared artist colors which began in the early seventeenth century. Traces the development of suitable containers for storing oil paint, starting with animal bladders, proceeding to metal syringes and ending with the collapsible tin tubes of today. Twenty-three references. RJG

1060. BONTINCK, ED. La fabrication des pastels. *Chim. peintures*, 7 (1944), pp. 243-256, illus., table.

The methods and materials for making pastel crayons are traced from their first literary mention in the sixteenth century to the present time. Forty-seven references.

RJG

1061. BRUMMER, ERNO. Artistic frescoes. *Magyar Mernok-Epítészegylet Közlönye*, 77 (1943), pp. 65-71; *C.A.*, 41 (1947), 7768; *Abstract Review*, no. 131, p. 53.

Optical effects depend on the quality of applied binders, the sequence of layers forming the actual picture, and the method of painting. The most durable frescoes are those which contain exclusively inorganic binders (with exception of casein if it is treated abundantly with lime).

1062. DOERNER, MAX. *The materials of the artist and their use in painting with notes on the technique of the old masters*. Rev. ed. Tr. by Eugen Neuhaus. New York, Harcourt Brace and company, 1949. 435 pp., illus.

Contents: Author's preface; Translator's preface; Preparation of grounds for easel pictures; Pigments; Binding media of oil painting; Painting in oils; Tempera painting; Pastel painting; Painting in water colors; Mural painting; Techniques of the old masters; The restoring of easel pictures; Bibliography; Appendix; Index.

Reviewed in: *Art News*, 48 (1949), p. 53; *Arts & Arch.* 66 (Sept. 1949), p. 23.

BMU

1063. GETTENS, RUTHERFORD JOHN, and STOUT, GEORGE LESLIE. *Painting materials; a short encyclopedia*. New York, D. Van Nostrand company, inc., 1942. 333 pp., illus., diagrs. Published as separate sections in *Technical Studies in the Field of Fine Arts* from 1936 until 1941.—Pref.

Contents: Introduction; Preface; Mediums, adhesives, and film substances; Pigments and inert materials; Solvents, diluents, and detergents; Supports; Tools and equipment; Glossary; Bibliography at end of each chapter.

RJG

1064. GLANNON, EDWARD JOHN. *Making your own art materials*. New York, 1943. 15 l. (Committee on art in American education and society. Pamphlet, no 1). Mimeographed.

Contents: Poster paint; Pastel; Charcoal; Oil paint; Finger paint.

BMU

1065. HILER, HILAIRE. *The painter's pocket guide methods and materials*. 2d Amer. ed., rev. and enl. Los Angeles, Calif., Research publishing company, 1945. 252 pp.

Contents: Drawing materials: charcoal, crayons, pencils, paper, etc.; Water colour methods: Distemper, colours, paper, washes,

brushes, gouache, tempera; Oil painting: Colours, the oils, diluents, varnish as a medium, siccatives and driers, glazing, a few rules; Supports; canvas, wood panels, cardboard, metal supports; Grounds: The underpainting, primings, glue grounds, casein grounds, vegetable glues, oil primings; Varnishes: Hard-resin, soft-resin, wax, nitrocellulose, rules for varnishing, preservation of brushes, conclusions on picture varnishing, other varnishes; Wax painting: oil and wax painting, wax-resin vehicles, varnishing wax painting, painting in solid wax; Murals: On canvas, buon fresco, fresco secco, tempera, oil on walls, wax fresco, water-glass fresco; Tools: brushes of the old masters, modern brushes, palette knives; palettes, easels; Pigments: manufacture and properties of pigments, mixing of pigments, grinding, conclusions, pigments at a glance; Conclusions; Appendix: The problem of colour, colour perception, Problems of contrast, colour and 'temperature', concept of colour, summary. Glossary—8 pp. of terms. Index. BMU

1066. JOHNSON, UNA E. New expressions in fine printmaking. *Brooklyn Mus. Bull.* 12, no. 1 (Fall, 1952) pp. 1-28; Catalogue of the exhibition, "New Expressions in Fine Printmaking," pp. 29-32.

Brief descriptions are given of printmaking processes, their history, the traditional techniques and modern experiments. The following subjects are included: relief and intaglio processes, the planographic process, stencil processes, cellocut, allied processes. Photographs of some examples in the exhibition are included. A summary (pp. 16-17) in chart form gives photographic details of subdivisions of these processes with very brief descriptions of their line, surface tone or texture, tools, materials, and variants. EHJ

1067. MAYER, RALPH. *The artists' handbook of materials and techniques*. New York, Dial press, 1938. 676 pp., illus.

Reviewed in: *Technical studies in the field of fine arts*, 9 (1941), pp. 180-185. British rev. ed. London, Faber and Faber, 1951. Spanish edition under title: *Manual del artista, materiales y técnicas*. Buenos Aires, 1948. BMU

1068. MAYER, RALPH. On the material side. *Art Digest*, 24 (Oct. 1949)-27 (Dec. 1, 1952).

These are a series of brief topics directed to the modern artist. They contain comments on materials and techniques and some practical formulas.

Contents: The status of the field (Oct. 1, 1949), pp. 27-30; Variety of contemporary work (Nov. 1, 1949), pp. 25-26; Varnishes—notes suggested by inquiries (Dec. 1, 1949), pp. 24-25; Fresco painting (Ethyl silicate) (Jan. 1, 1950), pp. 16-25, illus.; Respect for materials and tools (Feb. 1, 1950), pp. 26-29; Recent trends in painting mediums (Mar. 1, 1950), p. 22; The care of paintings (Apr. 1, 1950), pp. 30-31; Appropriateness of materials and techniques, Parts I-III (May 1, 1950), pp. 28-29 (June 1, 1950), pp. 22-23 (July 1, 1950), pp. 25-26; No uncertain terms (criticism of art critics) (Aug. 1,

1950), p. 19; Artists' canvas (Sept. 15, 1950), pp. 24-25; Panels (Oct. 1, 1950), pp. 26; Artists' oil paints, Parts I-III (Nov. 1, 1950), p. 24 (Dec. 1, 1950), pp. 26-27 (Jan. 1, 1951), pp. 26-27; Encaustic painting (Feb. 1, 1951), p. 27; Popular misconceptions about oil painting (Mar. 1, 1951), pp. 25, 33; The care of paintings, Part I-II (Apr. 1, 1951), pp. 24-25 (May 1, 1951), p. 25 (May 15, 1951), p. 33; Glazes and glazing, Part I-II (June 1, 1951), pp. 25, 33 (July 1, 1951), pp. 21-22; Tempera painting, Part I-II (Aug. 1, 1951), pp. 18, 25 (Sept. 15, 1951), p. 20; Care of paintings—Layman's queries (Oct. 15, 1951), p. 22; \* Material progress (a review for the special 25th anniversary number) (Nov. 1, 1951), pp. 53, 63; Commercial standard CS 98-42 (Nov. 15, 1951), p. 33; Questions and answers (Dec. 15, 1951), p. 27; Pastel painting (Jan. 15, 1952), p. 21; Metal in painting (Feb. 15, 1952), p. 21; Hazards of the trade, I-II (Mar. 15, 1952), p. 24 (Apr. 1, 1952), p. 33; The success of the serigraph (Apr. 5, 1952), p. 21; Questions and answers (Mar. 15, 1952), p. 20; Hard and soft resins: a reprise; (July, 1952), p. 22; Questions and answers (Aug., 1952), p. 22; About resins (Sept. 15, 1952), p. 24 (Oct. 15, 1952), p. 23; How to paint (Nov. 15, 1952), p. 24; The technical literature, Parts I-II (Dec. 15, 1952), p. 27 (Jan. 15, 1953), pp. 23-24.

\* Reprinted in *Art Material Trade News*, 4 (April 1952). RJG

1069. MAYER, RALPH. *The painter's craft; an introduction to artists' materials*. Toronto, New York, London, D. Van Nostrand company, inc., c1948. 218 pp., col. front., illus.

Contents: Introduction; Color; Pigments; Grounds; Oil painting; Tempera painting; Aqueous paints; Pastel; Mural painting; Studio and equipment; Additional reading; Index.

Reviewed in: *College Art J.*, v. 3 (Spring 1949), p. 238, by James Watrous; *Magazine of Art*, v. 42 (Oct. 1949), pp. 230-231, by Ralph Mayer. BMU

1070. MAYER, RALPH. Some notes on serigraph materials. *Serigraph Quart.*, 2 (Feb. 1947), pp. 3-4.

Now that silk-screen painting has become established as an artists' medium of expression, increased attention should be given to development of proper and permanent paints for use in this technique. Printing inks, and commercial paints used in industrial serigraphy are not suitable for artists' purposes. Good grade artists' tube oil colors can be reduced to proper consistency for silk-screen work. The use of pure rag paper is advocated. Simple tests for permanency of materials are outlined. It is expected that special serigraph paints for artists will be developed by colormen. RJG

1071. MELLWIG, BERNHARD J. Pasty vehicle for artists' paint. *U. S. Pat.* 2,594,273, April 29, 1952. *Abstract Review*, no. 181 (1952), p. 142.



A water-soluble, pasty paint vehicle for artists' paint contains a soap of triethanolamine and soap-forming fatty acid about 23-52 pounds, soap forming fatty acid 1-11 pounds, starch 20-25 pounds, carbohydate gum 24-30 pounds, a polyhydric alcohol, such as glycerine and sorbitol, 5-10 pounds, formaldehyde 3-3.5 pounds, and water 100-125 pounds. The paint is especially suited for classrooms, as it dries rapidly, is ready for use, and brushes and palette are easy to clean.

1072. "New sources, new materials." *Art News*, 48 (Apr. 1949)-.

This section begins with the above issue and is at present appearing monthly. Advertising with suppliers' addresses but gives much useful information about modern artists' materials. RJG

1073. NORDMARK, OLLE. *Fresco painting; modern methods and techniques for painting in fresco and secco*. New York, American artists group, inc., c1947. 126 pp., illus.

Contents: Walls; Preparation of mortar materials; Mortar mixing; Plastering the fresco ground; Fresco grounds; Intonaco; Preliminary work to painting the fresco; Painting the fresco; Secco painting in limecolor; Modeling of relief in mortar; Retouching; Preliminary work for plastering; The scaffold; Source of supplies; Index. BMU

1074. PRATT, FRANCES, and FIZEL, BECCA. *Encaustic materials and methods*. New York, Lear, c1949. 64 pp., illus. (part col.).

Contents: Foreword, by Edward W. Forbes; Authors' note; Methods, processes and formulas; Materials and equipment; Sources of supply; Bibliography. BMU

1075. Production of silk screen printing on vinyl film, *Plastics Ind.*, 9 (Jan. 1951), p. 15.

Description of process and equipment for decorating vinyl film by silk-screen printing. SR

1076. SHOKLER, HARRY. *Artists' manual for silk screen print making*. New York, American artists group, 1946. xi, 170 pp., col. front., illus., pls.

Contents: Equipment; How to make a serigraph; Development of technique; Approaches and contributions; The film stencil; The photographic stencil; The silk-screen process in schools; Miscellaneous notes; Index. BMU

1077. Standing committee to revise artists' paint standard: CS98-42. *Art Mat. Trade News* (Sept. 1950), pp. 27-28.

An account of a meeting to reactivate the Standing Committee for Commercial Standard CS98-42 on artists oil paints, which was set up under the auspices of the National Bureau of Standards in 1942.

RJG

1078. TAUBES, FREDERIC. *Studio secrets*. New York, Watson-Guption publ. inc., 1943. xii, 134 pp.

Contents: Foreword. Part I. Oil-painting materials and practices: 1. Education of the painter; Comparative merits of various techniques; Notes on materials; Painting tools; Preparation of the canvas; Notes on colors; Glossary of colors; Notes on the preservation of paintings; Miscellaneous notes, recipes, etc.; Studio equipment; Part II. Making and finishing picture frames: General observations; Glossary; Index.

BMU

1079. TOCH, MAXIMILIAN. *Paint, paintings and restoration*. . . . 2d ed. New York, D. Van Nostrand Co., 1945. 149 pp.

Contents: Introduction; Paintings; Scientific photography of oil paintings; Pictures and those who buy them; Imitations; Determination of genuine paintings; Infrared photography; The simple palette; Glazing; Permanent colors; X-ray as applied to paintings; Ultraviolet light; The varnishes; Dammar as a picture varnish; The newer picture varnishes; The synthetic resins; Lacquers; Stand oil; Restoration of paintings—composition of varnishes and their removal; Pigments; Grinding oil colors; Foundations for painting canvas, wood and metal; Bibliography; Index.

Reviewed in: *Chem. and Eng. News*, 24 (1946), p. 265.

BMU

1080. U. S. National bureau of standards. *Artists' oil paints . . . a recorded voluntary standard of the trade*. Washington, D. C., Govt. Print. Off., 1942. 23 pp. (CS98-42).

Contents: Purpose; Scope; Nomenclature; General requirements; Detail requirements; Methods of test; Labeling; Guarantee; Effective date; Standing committee; History of project; Appendix: Sponsors' notes on the commercial standard for artists' oil paints, by R. J. Gettens and F. W. Sterner; To the acceptor; Acceptors; Amendment (dated Jan. 1, 1952) with table of tinting; Strength of standards.

RJG

1081. WILBORN, F. Chemical problems of oil painting. *Lack-u. Farben-Chem./Chim. Peint. Vernis*, no. 3-4 (1949), pp. 61-65; *B. P. V.*, 23 (1950), p. 321; *Abstract Review*, no. 167 (1951), p. 71.

The physicochemical aspects of oil painting are discussed and many methods of improving the durability of artists' oil paintings, e.g., by careful choice of the correct pigment/oil ratio, by the addition of wetting agents, use of stand oil or alkyd resin media, careful selection of the ground, etc.

1082. WISKE, E. The technique of the silver pencil and its development. *Dtsch. Z. Malt.*, 58 (1942), pp. 25-31; *Chem. Zentr.*, Pt. 2 (1942), p. 1743; *C.A.*, 37 (1943), 6371.

The history and the application in modern art of this drawing technique are discussed and experiments with variously prepared papers are described.

1083. WOODS, R. D. B., and others. German artists' color manufacture. *Off. Tech. Serv. Rept.* PB A 49210 (1946), 10 pp.; *Abstract Review*, no. 126 (1947), p. 291.

This report describes the products of the German artists' color manufacturers such as oil colors, water colors, pastels, mediums, poster colors, crayons, drawing inks, etc. The raw materials, machinery, labor, export, war activities, and war damage sustained, are noted briefly. Appendix A lists the branch factories and the products of the largest manufacturer, Gunther Wagner of Hannover.

1084. WULF, HEINRICH. Artists' oil paints. *Farben, Lacke, Anstrichstoffe*, 4 (1950), pp. 295-298; *C.A.*, 44 (1950) 11115 *b*.

A concise summary of composition, available types, and techniques of application of artists' oil paints is presented.

1085. WULF, HEINRICH. Survey of fresco painting. *Farben, Lacke, Anstrichstoffe*, 3 (1949), pp. 113-116; *C.A.*, 43 (1949), 5199.

The technique and materials (substrate, binders, pigments) required for satisfactory results are concisely summarized.

1086. WULF, HEINRICH. Tempera paints. *Farben, Lacke, Anstrichstoffe*, 4 (1950), pp. 298-301; *C.A.*, 44 (1950), 11115 *b*.

A concise summary of composition, preparation, types, properties, technique of application, effect of varnish top coat, etc., is presented.

## U. PAINTINGS (INCLUDING WALL PAINTINGS, DRAWINGS, AND PRINTS)

### 1. GENERAL TECHNICAL OBSERVATIONS

1087. ARENS, KARL. Un fungo destruidor de pinturas a oleo; *Cladosporium herbarum* (Pers.) var. *Nigricans* (Roth). *Summa Brasil. Biol.*, 1 (Dec. 1945), pp. 1-13.

Black spots of a special type have been observed on oil paintings both in Europe and in Brazil. The cause is a fungus identified as *Cladosporium herbarum* (Pers.) var. *Nigricans* (Roth.). Even during its culture period it forms black deposits. On paintings it is convenient to speak of the phenomenon as "*Cladosporium* spots" or "blackening fungus." Observations are reported which show the distinctive operation of the fungus and its disfiguring effect. Conditions essential to the growth of the fungus and counter measures are discussed.

RJG

1088. AUGUSTI, SELIM. *Alterazioni dei dipinti murali: loro natura e cause*. Napoli, 1948. 27 pp.

Sept types d'altération; leurs causes: temps, soleil, poussières, gaz, humidité, chaleur, variations de température, vent, salpêtre, micro-organismes et parasites animaux et végétaux, matériaux ou technique défectueux, couleur et liants, homme; leurs effets. FD

1089. AUGUSTI, SELIM. Alterazioni osservate sugli affreschi dello Zingaro nel Chiostro del Platano, in Napoli. *Archivio Stor. Nap.*, 30 (1944-46), 8 pp.

Après une description des altérations, des analyses prouvent que les efflorescences sont constituées de carbonate de calcium et d'un peu de nitrate de calcium et sont dues à l'humidité dont on recherche les causes. Les méfaits des restaurations antérieures sont envisagés et, en conclusion, tout le mécanisme de l'altération est résumé. FD

1090. AUGUSTI, SELIM. Azione dei microrganismi e dei parassiti sui dipinti murali. *Boll. soc. natr. Napoli*, 55 (1944-45), pp. 68-73.

Le processus d'altération par les microorganismes, les parasites végétaux et par leur action combinée. FD

1091. AUGUSTI, SELIM. *Il contributo della chimica e della fisica all' esame dei dipinti*. Firenze, F. Le Monnier, 1942. 8 pp., 9 illus.

L'examen scientifique des peintures: identification des matériaux, étude de la nature et des causes d'altération, examen de la technique picturale. JT

1092. AUGUSTI, SELIM. *Natura e causa dell'alterazione degli affreschi di Paolo Uccello nel Chiostro Verde di S. Maria Novella in Firenze*. Napoli, Miccoli, 1948. 10 pp.

Description de l'altération; examen technique des conditions locales de conservation des fresques et prélèvement d'échantillon; examen chimique et microscopique des fragments prélevés; conclusion: action combinée de l'humidité et d'une attaque due à des microorganismes, bactéries et moisissures et à des insectes parasites. FD

1093. AUGUSTI, SELIM. *Natura e causa della efflorescenze bianche che si producono sugli affreschi*. Napoli, Miccoli, 1948. 18 pp.

De nombreuses analyses montrent que les sels formant les efflorescences sont de diverses natures. Le mécanisme chimique de leur formation est exposé. FD

1094. BONTINCK, ED. Comment étudier les anciennes techniques de la peinture artistique. *Chim. Peintures*, 8 (1945), pp. 75-84, illus.

A general discussion covering literary sources, visual methods, experimental methods and scientific methods including X-ray, infrared photographs, and microchemical analyses. RJG



1095. BONTINCK, ED. *Physica en schilderkunst*. Inleiding tot de studie van physische verschijnselen toegepast op schilderkunst en schildertechniek (Basis-Reeks, 14). Brussels, A. Manteau, 1943. 111 pp., 8 pls.

Introduction; Quelques principes de physique; Applications basées sur l'optique; Peinture opaque et translucide; Couleur d'une peinture sèche; Jaunissement de liants huileux; Maladies du vernis et son traitement; Pigments "migrateurs"; Le tableau et son milieu; Examen physique des tableaux; Craquelures dans les tableaux. PC

1096. BOSCH, LODEWYK. Het wetenschappelijk onderzoek van schilderijen. *Phoenix (Amsterdam)*, 2 (1947/48), pp. 15-20, 3 illus.

Généralités sur l'examen scientifique des tableaux. Rapprochement avec l'affaire des faux Vermeer. PC

1097. CONSTABLE, W. G. A discovery and a warning. *B.M.F.A.*, 41 no. 245 (1943), pp. 51-54.

A portrait, traditionally said to be of Mme. de Bourboulon by Hubert Drouais was given to the Museum. Removal of the discolored varnish revealed repainting far more extensive than had at first appeared. Examination with the aid of X-ray, infrared, and ultraviolet light helped to define the areas of repaint but were not very helpful in revealing the true condition underneath the repaint. Further cleaning revealed that extensive small flakings had been smeared over with lead putty, which covered much original paint. The restorer had then repainted most of the picture. The lead putty had blocked the penetration of the X-rays and limited the effectiveness of the infrared. The author points out that this picture presents a valuable lesson in the limitations of such means of investigation. EHJ

1098. COREMANS, PAUL B. *L'Agneau Mystique au laboratoire; examen et traitement*. Anvers, De Sikkels, 1953. 132 pp., 71 pls. (168 photos, some in color). (Les Primitifs flamands, III. Contributions à l'étude des primitifs, pt. 2.)

Contents: Physical history; Original materials and Eyckian painting technique; Examination of the picture before treatment; Physical condition before treatment; Eyckian perception and execution; Special problems; Investigation of the flora; Table of dimensions; Glossary; List of proper names; List of plates.

Reviewed in: *Conservation*, 1 (1952/54), p. 143, by A. E. Werner. BMU

1099. COREMANS, PAUL B. Technische inleiding tot de studie van de Vlaamse primitieven. *Gentsche Bijdragen Kunstgesch.*, 12 (1945-50), pp. 111-118.

The abrupt transition between the artistic production of the late fourteenth early fifteenth century and the easel paintings of the Flemish Primitives following van Eyck has been the subject of numerous

studies. Some explain this transition on purely aesthetic grounds, but scientists are inclined to think that the differences are caused by the use of different materials. They think the identification of the paint mediums will unlock the secret. It is well known that drying oils were used long before the time of van Eyck. Moreover, physicochemical and microscopic studies on paint specimens from the paintings of the Flemish Primitives show that the medium is oil, not tempera. In certain documents on the archives at Bruges dating 1345-46 are found such terms as "alambic," "eau-de-vie" and "tiribinthine" which indicate that distillation and diluents for thinning oil paints were known at least a century before van Eyck. PC

1100. COREMANS, PAUL, PHILLIPOT, A., and SNYERS, R. *Van Eyck—l'Adoration de l'Agneau; elements nouveaux intéressant l'histoire de l'art.* Antwerp, De Sikkels, 1951. 6 pp. + 4 pls.

During the recent cleaning of the Ghent altarpiece several observations were made which bear upon a few of the many questions that art historians have raised about this famous work. Among these are: (1) The brown letters of the inscription at the feet of the Christ are not original. The same is true of the crown which is rendered on top of an area of silver leaf. (2) The dove in the central panel has been overpainted in a heavy manner; the original left ear of the lamb has been revealed. (3) The so-called Tower of Utrecht appears to be a later addition because beneath it occurs a golden ray which seems to be part of the original work. Some authorities have claimed that the Tower is evidence that the work was begun in Holland but in the light of this new technical evidence this view cannot be substantiated. The tentative opinion is expressed that Jean Van Sorel, Canon of Utrecht, and Lancelot Blondeel, who restored the polyptych in 1550 may have made these additions. The reason for this is not clear, however, because there is no evidence that those areas were in poor condition at that time. RJG

1101. COREMANS, PAUL B. Treatment of the polyptych of the *Adoration of the Lamb. Museum (Paris)*, 4 (1951), English trans., pp. 66-68; in French, pp. 68-72.

This is a progress report on the cleaning of the Ghent altarpiece which was begun in October 1950 in the Central Laboratory of Belgian Museums in Brussels. It tells of the International Committee of experts who were invited to review the cleaning problem and to recommend a plan of work. In this plan the panels and their painted surfaces were to be impregnated with a material with a wax base. The thickness of the varnish was to be reduced. Repaint which concealed or might cause deterioration of original work was to be removed. A brief account of the history of the polyptych is given. RJG

1102. DEFENBACHER, DANIEL S. Fact or fancy; the Walker Art Center calls in the experts. *Mag. Art*, 38 (1945), pp. 58-61, illus.

Describes the results of technical examination and cleaning of several paintings in the well-known Minneapolis collection. RJG

1103. DUVERGER, JOZEF. Het grafschrift van Hubert van Eyck en het quatrain van het Gentsche Lam Godsretabel. Met een aanhangsel: E. Bontinck. Natuurwetenschappelijk onderzoek van de opschriften en de lijst van het Lam Godsretabel. *Verhandel. Koninkl. Vlaam. Acad. Wetensch. Belg. Kl. Wetenschap.*, 7, no. 4 (1945), 97 pp., 24 illus.

L'auteur est partisan de l'originalité de l'épithaphe gravée sur la tombe dite d'Hubert et du quatrain peint sur quatre cadres de l'Agneau Mystique. Il développe cette thèse, basée surtout sur des arguments historiques et matériels (examen scientifique par E. Bontinck). PC

1104. GOULD, C. A Correggio discovery. *Burl. Mag.*, 92 (1950), pp. 136-140.

A radiograph of Correggio's *Agony in the Garden* taken before the cleaning showed the figures of sleeping apostles which had been painted out owing to damage. The painting was restored to the artist's original intention. SRJ

1105. HAHN, HARRY J. *The Rape of LaBelle*. Kansas City, Mo., Frank Glenn pub. co., inc., 1946. 274 pp. illus., facsms.

Contents: Publisher's statement; List of illustrations; Introduction; Preface; The Rape of LaBelle; An old master business in full bloom; The world's greatest art dealer; History is the authenticator; Technique processes; A master develops a technique; Da Vinci, master of color; The Olympian critic; "Expert" examination?; Dating pigments; X-ray analysis; Certificate of "Genuineness"; "Happiness consists in being well deceived"; Appendixes 1-3; Bibliography; Index. BMU

1106. Horyūji temple. (Special edition devoted to the lost murals.) *Budhist Art*, 3 (1949), pp. 1-144, pls. (part col.). (In Japanese.)

Articles on the temple with a record of the conference held February 5-6, 1949, to discuss emergency measures for the Golden Hall of Horyūji temple and its murals. HPS

1107. IVINS, WILLIAM MILLS. *How prints look; photographs with a commentary*. New York, Metropolitan museum of art, 1943. 164 pp. illus.

Contents: Introductory notes; First principles; The planographic or lithographic processes; The relief processes (woodcuts—metal cuts); The intaglio processes; Color in prints; Of copies, facsimiles, and other bothersome matters; Note on a few points of interest (On the social importance of the graphic technique—The influence of the illustration—Of reproductive prints—Of reproductive print makers—On the economics of print publishing—Of the maintenance of standards—Of quality of impression—Of states and watermarks—Of the lighting of prints—Of enlargements—A philosophical note); Table of illustrations. BMU

1108. Japan, Ministry of Education. *Fire damage to Horyūji temple* (Jan. 26, 1949). Tokyo, Foreign service of the United States, 1949. 7 l. (Enclosure to Dispatch no. 162 of March 19, 1949 from U. S. Political adviser, Tokyo.) Mimeographed.

1109. KECK, SHELDON. The technical examination of paintings, *Brooklyn Mus. J.* (1942), pp. 71–82, 36 figs.

Technical examination consists of study by physical, optical, and chemical means of the materials, methods of construction, and current condition of a specific painting. In general it cannot alone authenticate and attribute a work, but it can help to do so. Chemical analysis of materials may give conclusive evidence of later copies and frauds by showing that they contain materials not of a period, but it does not identify artist, place of origin, or exact time. X-ray photographs may show technical details and changes in drawing and handling, but they do not usually distinguish layers. Contrast and detail depend on X-ray technique; dense pigment in any layer may obliterate significant details in other layers; it often does not show abrasion. X-ray photographs require skillful interpretation. Ultraviolet-ray examination may indicate repaint and falsifications, false and altered signatures, and painted crackle. It may, however, not show repaint that is covered with heavy varnish. It also requires careful interpretation. Infrared rays may reveal lines or tones covered by thin paint or darkened varnish more clearly than the unaided eye. Microscopic study of cross sections of paint shows the separate layers of paint, but it shows construction only at a given point. Low-power microscope often shows repaint clearly. Macrophotographs may be used to isolate characteristics of style and brush work. They however require careful comparison with a large number of related works photographed, developed and printed under standard conditions. RJG

1110. LIBERTI, SALVATORE. Sulla alterazione dei dipinti murali. *Boll. ist. centrale restauro*, 3–4 (1950), pp. 31–44.

Altération de peintures murales par efflorescences salines, moisissures et dépôts de nature variable. PC

1111. MANCIA, RENATO. *L'esame scientifico delle opere d'arte ed il loro restauro* . . . 2. ed. riveduta e ampliata. Milano, U. Hoepli, 1944–45. 2 v. illus. (incl. facsim.), diagrs. (Biblioteca del restauro).

Contents: V. I. Il nuovo apparecchio R. M. 3665; Laboratorio per l'esame scientifico delle opere d'arte; Dipinti Antichi—Imitazioni—Restauro; Esame fisico e chimico dei pigmenti coloranti e del solventi; Studio per il restauro delle navi Romane di Nemi; Appendice—Scuola del restauro. V. II. I raggi ultravioletti ed il filtro di wood applicati all'esame delle opere d'arte; I raggi infrarossi nell'esame delle opere d'arte; Filtre e luci monocromatiche; L'impiego dei raggi X nell'esame dei dipinti; Il restauro scientifico dei metalli; Studio storico artistico e scientifico di varie opere. BMU



1112. MÜLLER-SKJOLD, F. Physikalische Chemie und Maltechnik. *Dtsch. Z. Malt.*, 58 (1942), pp. 38-41; *Chem. Zentr.*, Pt. 2 (1942), p. 1743; *B.P.V.*, 17 (1944), p. 36; *Abstract Review*, no. 93 (1944), p. 126.

Compte rendu de la dépose de peinture murales anciennes à Tournai et Nivelles, Belgique. PC

1113. PACKARD, ELISABETH C. G. and KIRBY, JOHN C. The structure of some South German panel paintings. *J. Walters Art Gallery*, 10 (1947), pp. 90-97, 101.

The structure of a panel painting *The Flight into Egypt*, formerly thought to be Italian sixteenth century, was compared to four panel paintings by Bernhard Strigel dated about 1495. They are all composed of several knotty-pine boards with traces of coarsely woven fabric between the ground and the support. The Strigel panels had been thinned down and glued to a new pine panel and cradled, and two were dangerously cracked and blistered. The "Flight" bore evidence of two battens on the back. It had not been thinned and although warped and separated into three sections, the treatment of flattening, permeating it with wax-resin and reinforcing with metal strips was much more straight-forward than that of the two Strigel panels. The "Flight" panel has the additional advantage of having retained the valuable evidence of its original physical structure. EHJ

1114. Paris. Musée National du Louvre. *Hommage a Léonard de Vinci* . . . Paris, Éditions des Musées nationaux, 1952. 112 p. pls.

In the catalogue of Leonardo paintings notes are included on the physical state of many of the works, and the technical findings from laboratory examination. Also a final chapter "Documentation photographique;" by Madeleine Hours, is a catalogue of photographs and radiographs shown with the exhibition. RJG

1115. RAWLINS, FRANCIS IAN GREGORY. Physics in paintings. *Rept. Prog. Phys.*, 9 (1942/43), pp. 334-348; *Kodak Bull. Cur. Photo. Inf.*, no. 76/81 (1943), p. 62; *Review*, 18 (1945), p. 245.

The report surveys the methods available for the examination of the four strata of a painting: support, ground, paint film, varnish film. The use of methacrylate and other resins in modern painting technique is noted, with some comments on their merits and defects. The work of a gallery laboratory is described. Some details are given of apparatus and methods of obtaining photographs of macro- and micro-structures of paintings under normal, infrared, and ultraviolet illumination. X-ray examination is described, with numerical working data and illustrations of typical results. Spectrographic analysis is advocated for obtaining chemical information. The report concludes with observations on storage conditions and the air-conditioning of galleries, with figures for optimum humidity and temperature ranges. Fifty-eight references.

1116. RAWLINS, FRANCIS IAN GREGORY. Scientific examination of paintings. (Lecture). *J. Oil Col.*, 34 (1951), pp. 337-345; *C.A.*, 46 (1952), 7340*b*.

Scientific examination reveals how the great masters achieved their results and how scientific principles can be applied in matters of conservation. Factors causing deterioration over centuries are discussed. These are dimensional changes in wood fabrics and adhesives with changing humidity and temperature; shrinkage of vehicles, yellowing, etc. Creation of proper environment, use of synthetic moisture barriers like polyethylene, and removal of deteriorated but nonessential wood support and varnish aid in extending the life of a painting.

1117. ROUSSEAU, THEODORE. Report on an early Rembrandt, with technical notes by Murray Pease. *B.M.M.A.*, 6 (1947), pp. 49-53, illus.

A Rembrandt *Portrait of Saskia as Bellona* painted in 1633 was found on examination to be covered with at least two heavy coats of varnish, one toned. Fortunately the paint was sound and had not been affected physically except for traces of crackle in the thin dark passages. Distinction between the yellow and white metals in the armor was scarcely perceptible. (Shown in a color reproduction of the partially cleaned painting on the cover of the *Bulletin*.) This was no age-induced modification of the paint but a disfiguring curtain applied by a later hand. In some areas every refinement of tone relation had become invisible. The painting had previously been relined with a glue-type adhesive. Pressure applied at the time of relining had crushed some of the impasto. Removal of the old varnish was not difficult. No tinted varnish glazes were present. The paint layer was well preserved and showed only minor losses. After final cleaning the painting was given a synthetic resin coating which would have many times the life expectancy of a natural resin varnish. RJG

1118. STOPPELAËRE, ALEXANDRE. Déggradations et restaurations des peintures murales Égyptiennes. *Ann. Ser. Ant. Égypte*, 40 (1942), pp. 941-950, 10 pls.

The condition of wall paintings in several Egyptian tombs, including that of Queen Néfertari and those at the necropolis of Tounah el-Guibel are described. During the centuries in which the tombs were closed, a humidity and temperature equilibrium was established which favored the preservation of the wall paintings. Since the tombs were opened several decades ago, deterioration has progressed rapidly because of disturbing the equilibrium and exposure to alternate dry and moist conditions. Humidity and temperature measurements taken (by A. Lucas) within the tombs of Amenhotep II and Seti II show that on winter days variations of 8° in temperature and 14 percent in relative humidity are possible. The main causes of deterioration are (1) degradation of the rock wall support and (2) breaking up of the paint and plaster layers. Proposed methods of treatment are (1) injection of liquid cement, and (2) transfer. For various reasons the latter procedure is favored. RJG

1119. STOUT, GEORGE L. Examination of materials and methods in paintings. *Museum News*, 21 (1944), p. 7.

Abstract of a talk given at the annual meeting of the American Association of Museums in Williamsburg, Va., May 1942. RJC

1120. WERNER, A. E. *Scientific examination of paintings*. London, 1952. 15 pp. (Royal institute of chemistry. Lectures, monographs, and reports, no. 4.)

A summary of several lectures given to various local sections of the institute over the past several years. Discussed is the stratified structure of paintings which comprises mainly the support, ground, paint, and varnish surface coating layers; the effects of stresses and strains on the layered structure caused by dimension changes in the support (usually wood); the desirability of air-conditioning in galleries; the materials of conservation, especially the newer synthetic coatings; the use of X-rays and microchemical techniques to determine the condition of paintings and for the detection of fakes. RJC

## 2. CARE AND TREATMENT

1121. BAZIN, GERMAIN. Le polyptyque de "l'Agneau Mystique." *Rev. Arts*, 4 (1951), pp. 227-228, 1 pl.

Le traitement 1950-51 de "l'Agneau Mystique." Quelques résultats esthétiques, scientifiques et techniques. JT

1122. BLAŽIĆ, ZDRAVKO. La conservation des icônes en Macédoine. *Rec. Trav. Protect. Mon. Hist.*, 2 (1951), pp. 69-86, 17 illus.

Techniques opératoires des laboratoires du service des monuments historiques de la R.F. de Macédoine: examen scientifique préalable des oeuvres, détermination de l'état d'altération, conservation et restauration proprement dites. PC

1123. BLISS, WESLEY L. Preservation of the Kuaua mural paintings. *Amer. Ant.*, 13 (1947-48), pp. 218-222, pls., diagr.

The Kuaua ruins now known as the Coronado State Monument are situated on the western side of the Rio Grande near Bernalillo, N. Mex. During excavations of the site in 1953 paintings were found on the subterranean walls of the kiva. Adhering to the adobe wall of the kiva was a laminated layer almost 2 inches thick. The laminations consisted of thin adobe washes which averaged about one-thirtieth of an inch in thickness. In one place 17 out of a total of 85 layers were painted. To save the walls from weathering and destruction it was

decided to remove them *in toto* to the University of New Mexico. The mural walls on the northwest and south were jacketed as a unit and then sawed apart at the corners. The jacketing process is explained in detail with the aid of diagrams. In brief (1) the painted surface was sprayed with a thin solution of celluloid dissolved in acetone. (2) Three layers of tissue paper were tamped on with a wet brush. (3) While the tissue was still wet a thin solution of molding plaster was flipped on it until it was completely covered and immediately strips of burlap soaked in plaster were applied on top of the plaster layer and molded on the wall by hand. Three layers of plaster were applied. (4) Laths were laid against the wall at 6-inch intervals and were bound on with plaster-soaked strips. (5) A wooden framework of 1- and 2-inch timbers was made to fit the face of each wall. Each framework was bound to its respective wall by balls of excelsior and burlap strips soaked in plaster. (6) A trench was dug behind the kiva wall and then the wall was cut down until about a foot of the back side of the mural layers was exposed along the full length of a wall. (7) The exposed section was shellacked and when dry was applied with plaster-soaked burlap as in front. When firm the back of the kiva wall was cut down another foot and the jacketing process repeated until even the base was undercut and jacketed. (8) A framework for the back was applied and the front and back frameworks were bolted together.

The three main walls were 14–18 feet long and about 4 feet high. The average weight of the mural layers in the jackets was nearly 5 tons. Held rigid by the jackets the walls were transported to the University by truck. In the laboratory after removal of the jackets the paintings were stripped and remounted on hard wall board. Stripping was done by brushing the surface with Eastman stripping collodion, then by applying unbleached muslin and more collodion. When dry the muslin with the painting adhering was peeled from the wall. The back of the painting was applied with a solution of adobe mixed with casein; when dry the back was set down on the wall board support with Ambroid adhesive. When the Ambroid had set the muslin facing was removed by rolling it back sharply upon itself to expose the painting mounted solidly on the wallboard. RJG

1124. BONTINCK, Ed. *Physique & peinture; une introduction à l'étude de phénomènes physiques appliqués à la peinture et à la technique picturale*. Paris-Bruxelles, Les Editions Lumière, 1944. 119 pp., pls.

Contents: Introduction—L'Élaboration matérielle d'une peinture; Quelques notions de physique; Applications basées sur l'optique; Couleurs couvrantes et couleurs transparentes; Couleur de la couche picturale; Jaunissement des agglutinants oléagineux; Maladies du vernis et leur traitement; Pigments migrants; Milieu dans lequel vit un tableau achevé—Influence de ce milieu sur le tableau; Méthodes physiques appliquées à l'examen des tableaux; Craquelures, crevasses, fentes, etc.; Bibliographie générale. BMU



1125. BORRELLI, LICIA. Il distacco delle tombe Golini I e II di Orvieto. *Boll. ist. centrale restauro*, 5-6 (1951), pp. 21-50.

Les retards apportés à la bonne conservation des tombes leur furent préjudiciables; une transposition des peintures qui les recouvraient s'avéra nécessaire, en opérant de la même façon que pour la tombe de Tarquin (*Bollettino* 2 (1950), pp. 11-40, 85-93). Des analyses de l'enduit et des couleurs sont données. FD

1126. BORRELLI, LICIA. Primi provvedimenti nella Casa dei Grifi sul Palatino. *Boll. ist. centrale restauro*, 9-10 (1952), pp. 49.

Traitement provisoire des peintures murales fortement endommagées par l'humidité, à l'aide de gomme laque. FD

1127. BORRELLI, LICIA. Il trasporto di una tomba dipinta rinvenuta sulla via Portuense. *Boll. ist. centrale restauro*, 11-12 (1952), pp. 135-157.

Toute la technique du transport avec les précautions employées, depuis le lieu d'extraction jusqu'au Musée des Thermes. FD

1128. BRADLEY, MORTON C. *The treatment of pictures*. Cambridge, Mass., Art technology, 1950. 433 pp., illus.

Contents: Part I. Process of treatment. Part II. The treatment of pictures on fabric. Part III. The treatment of pictures on wood. Part IV. The treatment of wall paintings. Part V. The treatment of pictures on paper. App. A. Materials and supplies. App. B. Equipment. App. C. Formulas.

Reviewed in *Conservation*, 1 (Oct. 1952), p. 45, by H. J. Plenderleith. BMU

1129. BRANDI, CESARE. The cleaning of pictures in relation to patina, varnish, and glazes. *Burl. Mag.*, 91 (1949), pp. 183-188; also 92 (1950), pp. 297-298 (correspondence).

The existence of colored varnishes was observed in cleaning paintings by Coppo di Marcovaldo (1261), Benozzo Gozzoli (1456), and Giovanni Bellini. Various literary references to glazes are discussed and the concept of patina (with reference to paintings) is introduced, the function of which "is to conceal the materials used in a work of art, to arrest the work of art in the threshold of the image, to prevent it from relying for its appeal on irrelevant qualities." SRJ

1130. BRANDI, CESARE. Il fondamento teorico del restauro. *Boll. ist. centrale restauro*, 1 (1950), pp. 5-12.

Considérations théoriques sur la restauration. Importance du point de vue esthétique. PC

1131. BRANDI, CESARE. Relazione sui dipinti murali di Mattia Preti nella Chiesa di S. Giovanni a La Valletta, Malta. *Boll. ist. centrale restauro*, 9-10 (1952), pp. 3-7.

L'état de conservation, les altérations, les remèdes à appliquer sont examinés et le problème de l'enlèvement des surpeints du 19<sup>e</sup> siècle est mis en relief. FD

1132. BRANDI, CESARE. Sui problemi dei supporti. *Boll. ist. centrale restauro*, 1 (1950), pp. 13-19, 2 illus.

Dangers de la transposition sur toile de peintures sur bois et de peintures murales, à la suite de phénomènes de tension. Technique opératoire améliorée. Condamnation de la transposition de fresques sur ciment. PC

1133. BRANDI, CESARE. Sui supporti rigidi per il trasporto degli affreschi. *Boll. ist. centrale restauro*, 5-6 (1951), pp. 15-17.

Une étude sur les propriétés auxquelles doivent satisfaire les supports pour transposition. De neuf types rigides essayés, "l'Éternit" donne les moins bons résultats. FD

1134. Bruxelles. Palais des beaux-arts. *Traitement de l'Agneau Mystique; guide du visiteur*. Bruxelles, 1951. 20 pp., illus.

This little booklet was prepared as a visitors' guide for a special technical exhibition in connection with the recent cleaning, by A. Philip-pot, of the Van Eyck altarpiece of the Mystic Lamb, under the direction of the staff of the Central Laboratory of the Belgian Museums in Brussels. After a brief review of the technical history of the famous work, the various operations of examination and treatment are outlined. For the purpose of long-range conservation, the wood panels and the paint layers were impregnated with beeswax, and blisters were set down with wax-resin mixture. The old varnish was completely removed in certain areas of paint, in others not, depending upon esthetic considerations and upon the condition of the particular panel. Areas originally painted with copper resinate had turned brownish in tone; the blues had retained their original value. Repaint of earlier restorations, wherever it concealed the original paint, was removed. The cleaned painting will not be revarnished until sometime after it is returned to the cathedral of St. Bavon in Ghent. During the cleaning several areas of repaint applied in previous restorations were located. The mantle of the Virgin had been entirely repainted in 1859 with artificial ultramarine. When this was removed it was found that it concealed much of the original modeling in the lower part of the robe. Likewise, there had been much alteration around the head of the Lamb. Study of the medium draws the conclusion that the principal vehicle of the paint is a drying oil. There is also evidence that tempera was used in certain places. RJG

1135. BUCK, RICHARD D. Conservation and mounting of drawings. *ICOM News*, 2 (Feb. 1949), pp. 5-6 (in French), pp. 11-12 (in English).

A summary of the best materials and practices. Bibliography. RJG

1136. BUCK, RICHARD D. The inspection of collections. *Museum News*, 29, no. 7 (Oct. 1, 1951) ; abstracted in: *ICOM News*, 4, no. 6 (Dec. 1951), p. 24.

1137. BUCK, RICHARD D. Reclaiming a Flemish painting. *B.F.M.A.*, 10 (1947), pp. 193-209, illus.

A "Madonna and Child" in the Fogg collection, which is attributed to Rogier van der Weyden, had been questioned as to authenticity. Previous technical examination had overlooked important details of structure. Closer examination showed that the painting had been transferred from its original oak panel and cemented to fabric with white lead in oil. After transfer the new fabric was mounted on a sixteenth century panel that already carried a painting. The latter was recognized as a Flemish manneristic work of the time of Franz Floris, representing Venus, Cupid, Ceres and Bacchus. This complex of layers explained the confused structures shown in old radiographs. Details are given of the composite panel that was made to support the Madonna and Child after separation. It was made of thin red-wood sticks set in a mortar of wax-resin adhesive mixed with chalk and hard-wood sawdust. The attribution of the painting has not been changed. RJG

1138. BUCK, RICHARD D. Treatment of paintings on wood in museums not air-conditioned. (Abstract) *Museum News*, 25 (June 1947), p. 7.

A partial report of experiments on test panels treated variously with wax and with aluminum paint to determine the effectiveness of moisture barriers. Although moisture transfer was markedly reduced in some treated panels, all panels eventually changed in dimensions and in weight equal to the untreated controls. By comparing the behavior of the test panels with weight changes in a few small paintings, it can be estimated that moisture barriers give only partial protection against the long seasonal humidity cycles, but that they are extremely effective in insulating wood from short term fluctuations of humidity. With the help of some winter humidification, moisture barriers may bring the response of many paintings within limits that both wood and paint can tolerate without rupture. RDB

1139. CAGIANO DE AZEVEDO, MICHELANGELO. Il distacco delle pitture della tomba delle Bighe. *Boll. ist. centrale restauro*, 2 (1950), pp. 11-40.

Introduction et exposé des altérations, l'analyse de la couche picturale, et de l'enduit, la transposition de la peinture; les résultats. FD

1140. CAGIANO DE AZEVEDO, MICHELANGELO. Il distacco delle pitture della tomba del Triclinio. *Boll. ist. centrale restauro*, 3-4 (1950), pp. 84-93.

La technique est celle qui fut utilisée pour la tombe de Bighe; on décrit les particularités de la peinture, de la préparation, de l'enduit, ainsi que les altérations dont un type est analysé. FD

1141. CAGIANO DE AZEVEDO, MICHELANGELO. Il restauro degli affreschi romani del museo di Mariemont (Belgio). *Boll. ist. centrale restauro*, 11-12 (1952), pp. 159-179.

Les dommages causés par l'humidité ainsi que par l'utilisation de la cire sont examinés. La technique de la transposition et du nettoyage est décrite. FD

1142. CONSTABLE, WILLIAM GEORGE. Cleaning and care of the National Gallery pictures. *Nature (London)*, 162 (1948), pp. 166-167.

A detailed and critical review of the Report of the Committee of Confidential Inquiry (Weaver Committee) appointed by the Trustees of the National Gallery to consider the physical condition of the pictures and how it has been affected by cleaning, both recently and in the past. RMO

1143. CONSTABLE, WILLIAM GEORGE. Curatorial problems in relation to conservation. *B.F.M.A.*, 10 (1946), pp. 151-155.

The author outlines what a curator can do in the safeguarding of the collections in his care within the limits of his means and the systems already established. The importance of proper diagnosis of deterioration is stressed. Treatment is divided into "First-Aid," the treatment of symptoms, and the more elaborate treatment of the causes of deterioration. The value of records is pointed out. The author suggests that for the training of curators in the recognition of deterioration and understanding of treatment and for the adequate care of works of art in the smaller museums a center is needed where several museums could pool their resources to maintain an adequate laboratory, staff, and research center. EHJ

1144. COREMANS, PAUL B. Dépose des peintures murales découvertes en 1940 à Tournai et à Nivelles. *B.A.H.B.*, no. 6 (1941), pp. 125-132.

A method for transfer of wall paintings uncovered from beneath plaster is described. The paintings were originally done in tempera and had been considerably damaged. The method consisted in (1) drying out the wall with artificial heat, (2) spraying the surface with celluloid solution made from celluloid bearing 18 percent tricresyl phosphate. For the first two or three spray coats 1 percent celluloid in equal parts acetone and amyl acetate were used. Last coats, to build up to a shiny surface, employed 10 percent celluloid solutions. (3) With paintings of large dimension it was necessary to break the area up into several fragments; these are delimited with small nails. (4) A layer of kaolin, in suspension in a mixture of equal parts of amyl acetate and alcohol, was applied over the surface to give tooth for the facing layer which followed. (5) After drying, the surface was covered with a thick layer of starch paste prepared from water to which a little alcohol was added. One then affixed two thicknesses of fine tissue paper, then a layer of strong paper, next a layer of closely



woven cloth, and finally a layer of the same strong paper. The various pieces of paper and cloth were attached with starch paste, allowing suitable drying period between layers. The succession of layers was completely dry at the time of transfer. The next operation was to delimit, with a crayon, the areas for separate detachment and to cut them into sections with a thin knife. Lifting the faced fragment away from the wall was done with a thin steel blade. (Transfer to a new support in the Museum Laboratory is to be described later.)

RJG

1145. COREMANS, PAUL B. *Peintures murales anciennes; procédés, altération, nettoyage et transfert. B.A.H.B., 3<sup>e</sup> ser., 12th année (1940), pp. 133-136; Chem. Zentr., Pt. 1 (1941), pp. 3446-3447; C.A., 38 (1944), 2223.*

A process for the removal and remounting of fresco, encaustic, and tempera paintings is described. Bibliography.

1146. COREMANS, PAUL B. The recent cleaning of Rubens' "Chapeau de paille." *Burl. Mag.*, 90 (1948), pp. 257-261, illus.

After the cleaning of this National Gallery painting in the summer of 1946 several correspondents on *The London Times* claimed that the painting had been severely overcleaned with consequence that color and tonal relationship were altered. After careful examination the author concludes this was not so. This painting, done on oak panel, was enlarged by Rubens himself during the course of painting by the addition of wood strip on the right and one across the bottom. The more intense luminosity of the chalk-ground on the added strips made it necessary for the artist to raise the luminosity, particularly the blue of the sky, of the original panel on the left. Cleaning away of yellow varnish (added in later restorations) has accentuated contrasts, but has not removed original paint. The blue of the sky, which is of white lead and smalt is hard and tough and resistant to solvents. Black paint used in the delicate terminations of the feathers and laid over the blue is intact. Black oil paint is well-known to be easily affected by strong solvents and abrasive action. The green tone seen at left of the face is not caused by overcleaning but was painted that way by Rubens and can be seen in other paintings by that artist.

RJG

1147. COMSTOCK, HELEN. Methods of preservation in the Johnson Collection. *Connoisseur*, 109 (1942), pp. 63-65.

About half of the paintings in the Johnson Collection have been scientifically examined by David Rosen, who is also responsible for their conservation. An example is given of the detection by X-rays of extensive repainting (addition of a hat and a gloved hand) in a portrait by Anthonie Palamedes. The radiograph and the picture before and after cleaning are reproduced. Among other paintings the treatment of the Van der Weyden *Crucifixion* is noted. The problem of

panel treatment is mentioned: cradling is condemned but reducing the thickness and bedding down on aluminium with wax adhesive is found to be satisfactory. SRJ

1148. COUTO, JOÃO. *Aspectos actuais do problema do tratamento das pinturas*. Lisboa, Excelsior, 1952. 31 pp., illus.

Facteurs d'altération et leur action sur les diverses couches d'un tableau ancien. Examen scientifique préalable. Quelques principes généraux en matière de restauration. Illustration à l'aide d'exemples choisis à l'atelier de restauration du Musée National d'Art Antique, Lisbonne. Le rôle de l'ICOM (Commission internationale pour la restauration des peintures) et de l'UNESCO (périodique *Museum Paris*). PC

1149. COX, ALLYN. The wall paintings of the Alsop House. *Antiques*, 58 (Sept. 1950), pp. 171, 174-6.

The Alsop House in Middletown, Conn., begun in 1839, has interior and exterior murals painted in oil or oil varnish. The original paint, which was scaling and cracked, was coated with a wax composition driven in with a hot iron. Reconstructions or copies were prepared by the author. There is a discussion of the sources of the design elements and the possible identity of the artist. EHJ

1150. DESNEUX, JULES. *Rigueur de Jean van Eyck; à propos d'un diagnostic médical sur un tableau de 1436*. Bruxelles, Edition des artistes, 1951. 76 pp., 16 pl.

Contient des commentaires sur le traitement des tableaux anciens et notamment sur le "Chanoine van der Paele" (van Eyck, Bruges) au sujet duquel un diagnostic médical est établi. PC

1151. DOLLOFF, FRANCIS W. Transfer of a fifteenth century print from wood to paper. *B.M.F.A.*, 49 (1951), pp. 66-69.

A woodcut, thought to be Flemish fifteenth century, printed in brown ink on two sheets of paper joined in the middle, had been colored by hand and mounted on a rough pine panel. It was stained and had been attacked by silverfish and woodworms. It was first cleaned with alcohol. Photographs and a scale drawing were made so that the individual pieces could be put back into their proper places. An outline drawing was made on specially made paper of the same weight and texture as the original. The adhesive was softened in warm water and the original pieces removed, individually cleaned, and mounted on the new paper. The print was carefully dried, the losses inpainted and the surface sprayed with poly-vinyl-copolymer. Dirt, atmospheric conditions and sulfate stains had changed some of the colors, but treatment with water was possible since old watercolor becomes fixed to the paper. EHJ

1152. FELL, H. GRANVILLE. The deposition—and the resurrection. *Connoisseur*, 116 (1945), p. 53.

In welcoming the postwar opening of the National Gallery the editor comments briefly on the appearance of certain paintings some of which have been satisfactorily 'doctored, nursed, restored to health and groomed afresh'. SRJ

1153. FELL, H. GRANVILLE. "The Madonna of the Rocks!," by Leonardo da Vinci; a successful restoration. *Connoisseur*, 124 (1949), p. 52.

A brief note in praise of the newly cleaned painting together with a paragraph on its history. SRJ

1154. FELL, H. GRANVILLE. The National Gallery of cleaned pictures; pulvis et umbra, a false unity—a strip-tease exhibition. *Connoisseur*, 120 (1947), pp. 122-125.

An editorial on the "Cleaned Pictures" exhibition at the National Gallery giving personal reactions to the paintings in their new state and a reflection of the current criticism. Seven reproductions. SRJ

1155. FELLER, ROBERT L. The conservation of paintings. *Carnegie Mag.*, 26 (January 1952); pp. 370-373. Reprinted, *Art Mat. Trade News*, 4 (March 1952), p. 24.

A general discussion of the concept of "conservation" as opposed to that of "restoration." RLF

1156. FIERENS, PAUL. Faut-il nettoyer les tableaux anciens? *Rev. gén. belge*, 40 (1949), 7 pp.

Nettoyage "scientifique" ou "artistique." Exemples dans diverses galeries. PC

1157. GERSON, H. Cleaning the "Night Watch." *Burl. Mag.*, 89 (1947), p. 345.

When Rembrandt's *Night Watch* was unrolled from the cylinders on which it had been stored during the war, lack of adhesion was found in the relining of 1851. The painting, now relined and cleaned by H. H. Mertens, had suffered through much revarnishing, treatment with copaiva-balsam, and overpainting, no less than 63 repaired spots and tears being found. The reappearance of the true colors has completely transformed the painting. SRJ

1158. GETTENS, RUTHERFORD JOHN. Bleaching of stained and discoloured pictures on paper with sodium chlorite and chlorine dioxide. *Museum (Paris)*, 5 (1952), pp. 116-130; *C.A.*, 46 (1952), 9385e.

Prints and drawings which bear no fugitive colors may be effectively cleaned and bleached without danger to the paper by (1) 15 minute immersion in 2 percent solution of  $\text{NaClO}_2$  in water followed by washing; (2) by immersion in a half or third saturated solution of  $\text{ClO}_2$  gas in water followed by a minimum of washing; (3) by exposure of the dampened print in a  $\text{ClO}_2$  gas chamber for 15 minutes or more. Methods 2 and 3 are used when the paper can stand little

or no washing or handling. A simple all-glass apparatus for the generation of  $\text{ClO}_2$  gas by adding  $\text{H}_2\text{SO}_4$  to 10 percent  $\text{NaClO}_2$  solution and a gas bleach chamber are described. Experiments are described which demonstrate the superiority of  $\text{ClO}_2$  over  $\text{Cl}_2$  in respect to retaining the strength of paper.

1159. GOODESON, J. W. A cleaned Frans Hals in the Fitzwilliam Museum. *Burl. Mag.*, 91 (1949), pp. 197–198.

An example of a painting, 'improved' in the nineteenth century, restored to its former state. The ground is red-brown and the only pigments used are black, white, yellow ochre, and Venetian red. SRJ

1160. GOULINAT, JEAN GABRIEL, and AUBERT, LUCIEN. *Technique de la peinture; détérioration et restauration*. Texte rédigé sous la direction de Monsieur J. G. Goulinat, Chef de l'Atelier de restauration du Musée du Louvre et Monsieur Lucien Aubert, Secrétaire de l'Atelier de restauration. 1950. 13 pp., dactyl.

1161. HALL, HENRY C. Restoration of water-colour drawings. *Apollo (London)*, 51 (1950), pp. 52–53.

Results are illustrated but no working methods are described. RJG

1162. HAN, VERENA. The problem of cleaning pictures—Subject of international discussion. *Rec. Trav. Protect. Mon. Hist.*, 2 (1951), pp. 51–58.

Généralités centrées sur le rapport Weaver.

PC

1163. HENDRICKS, P. A. Restoration work done at Johannesburg Art Gallery to oil paintings, by Thomas Baines (1822–1875). *SAMAB*, 2 (1941), pp. 121–192; *C.A.*, 37 (1943), 2594.

Descriptive.

1164. HENDY, PHILIP. Picture galleries. *Museum (Paris)*, 2, no. 2 (1949), pp. 43–45, illus.

One of a series of articles on the postwar outlook for museums. Discusses, *inter alia*, the policy with regard to the technical problems of conservation. Illustrated with photographs of two National Gallery paintings: the Piero della Francesca *Nativity*, and the Giovanni Bellini *Madonna of the Meadow*. The former is taken with raking light and the latter with reflected light. SRJ

1165. HOURS, MAGDELEINE. Le contrôle photographique de la restauration au laboratoire du Musée du Louvre. *Museum (Paris)*, 3 (1950), pp. 328–331, illus.

Three illustrations taken during the transfer of Francia's *The Crucifixion*, and two photographs, one of them in the infrared, of Rembrandt's *The Carpenter's Household*. IG



1166. International council of museums. Commission for the care of paintings, 1st. Paris, 1948. The ICOM commission on the care of paintings. *ICOM News*, 2 (Feb. 1950), pp. 1-2 (in French), p. 8 (in English).

List of delegates, and resolutions passed at the first meeting of the Commission, which was held at the National Gallery in London, December 13-15, 1948.

1167. International council of museums. Commission for the care of paintings, 4th. Brussels, 1951. Report . . . *ICOM News*, 4 (Dec. 1951), pp. 16-17.

Resolutions of the fourth meeting of the *ICOM Commission for the care of paintings* held in Brussels October 27-31, 1951, under the chairmanship of Paul Fierens. RJG

1168. IWASAKI TOMOKICHI 岩崎友吉. Studies on the clay materials; preservation of wall bodies of Hōryūji temple. *Sci. Pap. Japn. Antiques*, No. 1 (Jan. 1951), pp. 54-56.

Treatment of the wall paintings of the Golden Hall of Hōryūji after the fire of 1949 are described. Experiments on the heating of pigments and walls in the furnace are reported. KY

1169. KECK, SHELDON. The care and cleaning of your pictures. *Brooklyn Mus. Bull.*, 10, no. 3 (1949), pp. 1-12, illus.

The materials and structures of painting are described. The importance of knowledge of the layered structure or third dimension of paint films in understanding the causes of deterioration is emphasized. Processes involved in treatment of a painting include preservation, revelation and compensation. Advice is given to the curator and private collector concerning cleaning and care. RJG

1170. KECK, SHELDON. A case of artistic face-lifting. *Brooklyn Mus. Bull.*, 12, no. 4 (1951), pp. 16-21.

A portrait, said to represent *Lady Georgiana Gordon*, by John Hoppner, was extensively repainted in the head and left hand. X-rays showed that the undamaged original painting underneath differed in many details from the surface appearance. The discolored varnish and repaint were removed with a mixture of petroleum benzene 50 percent, acetone 30 percent, diacetone alcohol 15 percent, and methyl alcohol 5 percent. The original head proved to be less "pretty" in feature if more attractive in color. The left hand and arm were less finished than the rest of the painting and had suffered from abrasion, as had other areas. Inpainting was done in tempera paint followed by pigments in a polyvinyl acetate solution. The picture was coated with polyvinyl acetate. The painting still bears no resemblance to other portraits of the supposed sitter. EHJ

1171. KECK, SHELDON. On the conservation of early American paintings. *Antiques*, 53 (Jan. 1948), pp. 52-54.

The materials and structure of early American paintings are discussed briefly. The wide range of condition from excellent to poor is attributed to the difference in their subsequent treatment and not to differences in their construction. Five symptoms for which the conservator looks in analyzing the condition of a painting are listed. A portrait of *Deborah Hall* by William Williams, dated 1766, is discussed as an example of some of these symptoms and of the measures used to treat them. Advice to owners of such works covers care and treatment, including a list of "Don'ts." EHJ

1172. LIBERTI, SALVATORE. Nuovo sistema di asportazione delle cere sui dipinti murali, I. *Boll. ist. centrale restauro*, 5-6 (1951), pp. 51-55; II, *ibid.*, 7-8 (1951), pp. 43-46.

Fresques de Zingaro, cloîtres de Platono, Venise. Enlèvement à chaud de la "crasse" et de la cire par la triéthanolamine et l'émulsion O. PC

1173. Lisbon. Museu Nacional de Arte Antiga. 5<sup>e</sup> Conférence, Commission Internationale de l'ICOM pour le Traitement des Peintures. *Bol. Museu Nacional Arte Antiga*, 2, n<sup>o</sup> 3 (1952), 63 pp., illus.

Compte rendu de cette Conférence qui a eu lieu à Lisbonne, en octobre 1952. Contributions intéressantes de João Couto (Aspects actuels du problème de traitement des peintures), A. Alvim de Matos (Etude sur les bois servant de support aux tableaux), J. Pinto Lopes (Altération par les moisissures des oeuvres d'art en bois), Maciel Chaves (Quelques insectes qui s'attaquent au bois). Glossaire technique portugais-français-anglais. PC

1174. London. National Gallery. *An exhibition of cleaned pictures* (1946-1947). London, Printed for the Trustees of the National Gallery, 1947. 104 pp.

Contents: Foreword; Glossary; Catalogue: A. Seven introductory pictures; B. Apparatus; C. The cleaned pictures; D. Photographs and a colour print; Index of paintings in the exhibitions; Bibliography.

Reviewed in: *The Times*, May 8, 1948, by J. R. H. Weaver. BMU

1175. MAROT, PIERRE. Recherches sur les origines de la transposition de la peinture en France. *Ann. Est (Nancy)*, (1950), 44 pp.

Histoire de la transposition au 18<sup>e</sup> s. Rôle de Roxin, Picault, Godefroid, Colins, Hacquin, Riario, Michelini, Simone, Contri, Paccini et autres. PC

1176. MOSCHINI, VITTORIO. Recent restoration in Venice. *Burl. Mag.*, 89 (1947), pp. 340-345.

At the end of the war the need for restoration had become urgent for many paintings. Moschini describes work carried out mainly by Manro Pellicoli. Tintoretto's *St. Roch in Glory* had previously been attached to a panel; in a subsequent incompetent restoration the crease

which had developed had been treated by slitting and by nailing; the nails had corroded thus rotting the canvas. The canvas was removed from the panel and relined. The treatment of further works, including those of Carpaccio and Tiepolo, is mentioned but no technical details are given beyond the statement that the methods followed a long tradition. Seven reproductions. SRJ

1177. Museum (Paris). *The care of paintings*. Paris, 1951. 163 pp. incl. illus. (UNESCO Publ. 778). English and French.

Contents: Introduction, by Théodore Rousseau; I. The Weaver report on the cleaning of pictures in the National Gallery; II. The Louvre Museum and the problem of the cleaning of old pictures, by René Huyghe; The restoration of the *Pietà* of Sebastiano del Piombo; by Cesare Brandi; Some comments on the cleaning of *The Night Watch*, by A. van Schendel; Cleaning and restoration of old paintings, by Paul Coremans; The future of museum conservation, by Murray Pease; The cleaning of pictures at the National Gallery, by the National Gallery; III. The ICOM Commission for the care of paintings and the problems of cleaning; Treatment of the Polyptych of the *Adoration of the Lamb*; Index.

The articles listed first appeared in *Museum (Paris)*, 3, nos. 2, 3 (1950); 4, no. 1 (1951).

Reviewed in: *Art Digest*, Dec. 15, 1951, p. 24, by Ralph Mayer.

BMU

1178. NICOLSON, BENEDICT. Cleaning and restoration of some pictures from Vienna. *Burl. Mag.*, 91 (1949), pp. 223-224.

A note written on the occasion of the London exhibition of art treasures from Vienna. SRJ

1179. PEASE, MURRAY. A treatment for panel paintings. *B.M.M.A.*, 7 (1948), pp. 119-124, illus.

The extensive practice of applying wood cradles to the back of panel paintings is questioned. Although a cradle may be an attractive piece of the cabinetmaker's craft, it often defeats its own purpose and may, bedded in trenches, supply rigidity in the opposite direction. The cradle opposes, by fixed rigidity, the inherent tendency of the panel to assume a simple all-over warp caused by greater shrinkage on the back than on the front with the result that strains and cleavages are set up in the paint films. An example of another method of treatment is given in which moisture is first applied to the reverse causing the panel temporarily to resume its original flat state. Channels are then cut in the reverse. The reverse surfaces are impregnated under radiant heat with beeswax-dammar resin-gum elemi mixture. The channels are then filled with redwood strips. Hardwood dowels embedded in trenches supply rigidity in the opposite direction. The whole rear surface is covered with Irish linen and sealed with the same thermoplastic adhesive. The panel is kept under light pressure

until the adhesive sets. The basic purpose of the method of treatment is to discourage movement rather than to oppose it by constriction.

RJG

1180. PLENDERLEITH, HAROLD JAMES. Cleaned pictures at the National Gallery (London). *Nature (London)*, 160 (1947), pp. 523-525.

A review of the exhibition of cleaned pictures at the National Gallery. Discusses the issues involved and the change in outlook resulting from the application of scientific methods of examining pictures.

SRJ

1181. The problem of cleaning. *Burl. Mag.*, 89 (1947), pp. 329-330.

Editorial introducing a number largely devoted to restoration on the occasion of the National Gallery Exhibition of Cleaned Pictures. The cleaning of the Baptistry doors, leading to a revised conception of Renaissance sculpture, and of the *Night Watch* have established that the treatment is justified in certain circumstances, quite apart from the need to preserve. The main objections have been on how certain pictures ought to be treated and not whether they ought to be cleaned. How many critics have watched the cleaning or heard a restorer expound the technical problems? Remarks such as "irretrievably ruined" and "skinned" are hysterical and senseless. The only fruitful argument is: what to clean; how; and how far. "Taste" is ultimately involved. The photographic and other clinical paraphernalia then become useless. Paintings so badly worn and ghost-like as to fall in the category of falsehood should be left alone or half cleaned. The exhibition shows too much store on science, too little on sensibility. Not only scientists but "human beings devoted to the arts" (other than painters) should be consulted when a delicate operation is contemplated.

SRJ

1182. PROCACCI, UGO. Recent restoration in Florence: I. Masaccio's "Madonna with St. Ann"; II. Fra Angelico, Sassetta and others. *Burl. Mag.*, 89 (1947), pp. 309-316, 330-335.

The author describes restoration work at the Gabinetto dei Restauri of the Uffizi for which he was responsible and which was the subject of a current exhibition. The Masaccio had in the past been drastically cleaned and extensively repainted. Furthermore, a coating of white of egg had been applied, which was by now causing the paint to flake off. The removal of accretions was carried out under the microscope mostly by the dry method. Illustrations show the painting before and during cleaning. The Sassetta and Fra Angelico triptychs were disintegrating as a result of inexpert war time storage. Transfer was indicated for both. The results are illustrated and notes given on the painters technique thus revealed: Angelico's silverpoint contours, rigidly respected in the painting, and Sassetta's free brush drawing. In a further example a *Madonna and Child*, now attributed to the Magdalen Master was discovered beneath two superimposed versions, added in the thirteenth and nineteenth centuries. The final ex-



ample is an account of the recovery of the fragments and restoration of the fresco in Filippino Lippi's house, which was destroyed by bombs. SRJ

1183. PROWSE, RUTH. The examination of pictures. *SAMAB*, 2 (1940), pp. 109-113; *C.A.*, 37 (1943), 2594.

The preservation and treatment of paintings are discussed.

1184. RAWLINS, FRANCIS IAN GREGORY. The cleaning of pictures; some physical aspects. *Paint. Mfg.*, 19 (1949), pp. 39-45, 57; *Abstract Review*, no. 145 (1949), p. 103.

Cleaning is practiced continuously in art galleries. It is concerned with backs and edges of pictures as much as with the fronts. Before a picture is cleaned, it is carefully examined, microscopically as well as macroscopically; under ultraviolet, infrared, and X-ray illumination. Some examples taken from the Weaver Committee Report are discussed.

1185. RAWLINS, FRANCIS IAN GREGORY, and WERNER, A. E. Paint techniques at the National Gallery (London). *Paint Technol.*, 15 (1950), pp. 291-299; *C.A.*, 44 (1950), 10343.

The scientific care of the collection of paintings in the National Gallery is discussed. War experience indicated that conditions of 63° F. and 58 percent relative humidity were good for the preservation of paintings. In the absence of air-conditioning, the use of moisture barriers on the backs of panel paintings seems desirable to minimize the effects of humidity changes. Saran, polythene, and waxes are being studied. Pigments are identified by reaction to form characteristic cryst. ppts., by spot tests, and by optical examination (sometimes with the use of the von Federov stage). Vehicle analyses are crude and unsatisfactory, and it is hoped that chromatographic analysis will prove helpful. Surface coating with polybutylmethacrylate in place of natural resin varnishes is being considered. The uses of ultraviolet and infrared radiations for the detection of spurious areas and the condition of underlying layers are cited. Colorimeters and Glossmeters are used to record the indicated properties. The Ultrapak microscope is used to reveal repainted areas and spurious cracks. Conjecture is made concerning artists materials of the future, polymethylmethacrylate supports and pigment binders and polybutylmethacrylate surface coatings being envisioned.

1186. RAWLINS, FRANCIS IAN GREGORY. Scientific methods in the conservation of pictures. *Endeavour*, 7 (1948), pp. 104-110; *B. V. P.*, 21 (1948), p. 430; *Abstract Review*, no. 146, p. 143.

An outline of the reasons for the methods of removing old varnish films from pictures is given. Nondestructive testing methods include the use of electromagnetic radiations (including infrared, ultraviolet, and X-rays) and the microscope.

1187. Restoration in Italy. *Burl. Mag.*, 89 (1947), p. 55.

A short editorial on the progress of postwar restoration in Italy. Illustrated by reproductions of the reverse side of the paint films of the Fra Angelico Cortona polyptych taken during a transfer operation.

SRJ

1188. ROELOFS, WILLEM E. *Het bewaren, vernissen en herstellen van schilderijen*. 2d ed. Antwerpen, Maeyens, 1942. 48 pp.

Vernis de tableau. Le vernissage. La conservation des oeuvres d'art. Petites réparations. Le doublage. Le rentoilage. Le dévernissage. La régénération.

PC

1189. ROSEN, DAVID. Notes on the preservation of panel pictures. *J. Walters Art Gallery*, 4 (1941), pp. 123-127.

The traditional procedures used in attempts to prevent the warping and cracking of paintings on wooden panels are reviewed. These include: (1) transposing the gesso ground and paint film to canvas, (2) reducing the panel to a thin section and mounting this on another panel, and (3) cradling. Objections to these methods are discussed. The author recommends that badly warped panels that are otherwise sound be left as they are. If the paint surface is in danger or the panel has been planed down or damaged by a cradle, treatment with a wax and resin mixture is recommended. Metal strips may be attached to give mechanical strength if necessary. Panels weakened by being planed down may have an aluminum backing for reinforcement.

EHJ

1190. ROSSITER, HENRY PRESTON. A drawing by Blake, restored. *B.M.F.A.*, 46 (1948), pp. 69-71.

A water color, *Abraham Preparing to Sacrifice Isaac*, was largely obscured by a heavy coating of varnish, no doubt applied by Blake himself. It was adhered to a paper, then a cardboard backing. The threat of the paper disintegrating made treatment necessary. Francis W. Dolloff removed the cardboard backing first. The paper backing, adhered with paste and saturated with varnish, was more difficult to remove. The surface coating was removed with alcohol. The drawing was dipped in an alcohol bath for 5 minutes, dried, reimmersed for the same time, then while still wet dipped in a hot water bath for 5 minutes longer. A few stubborn residual spots yielded to a final washing in alcohol. The water color washes were well set so that the water did no harm. The subdued color of the drawing was apparent for the first time in perhaps a century and a half. EHJ

1191. ROSSITER, HENRY PRESTON. On the care of prints. *Print Coll. Q.*, 30 (Mar. 1950), pp. 33-40.

Recommendations are made on the care and handling of fine prints. The injury caused by the cutting of margins, the abrasive action of dirt and dust, careless handling, damp air, water drip, and poor mounts are described. Amateurs are advised not to attempt home treatment of prints but to leave that to professional print restorers.

RJG

1192. ROTH, JAMES. The separation of two layers of ancient Chinese wall-painting. *Artibus Asiae*, 15 (1952), pp. 145-150, pl.

Cf. also Lawrence Sickman. An early Chinese wall painting newly discovered. *Ibid.*, pp. 137-144. It describes how a painting on a mud-wall painted over an older painting on similar mud-wall were separated. The upper painting was scored with a sharp knife in 10-inch squares to a depth of one-eighth inch. After facing each square with Tosa paper attached with polyvinyl acetate, the mud support of the upper painting was sliced through parallel to the surface with a thin wire probe. The mud from the surface of the under painting was removed mechanically. Assembly of the upper painting and fixing and mounting of both paintings on Masonite support are described in some detail. RJG

1193. ROTH, JAMES. Wax relining. *Museum News*, 29 (Nov. 1, 1951).

Abstracted in: *ICOM News*, 4, no. 6 (Dec. 1941), p. 25.

1194. ROUSSEAU, THEODORE. The cleaning controversy. *Art News*, 46 (Oct. 1947), pp. 21-25, 46-47, illus.

Mainly the author's views on the controversy which was set off by "An exhibition of cleaned pictures, 1946-47" in London National Gallery. The practices of "progressive restorers" and of "conservative restorers" are described. Comments are made on restoration activities in London, Paris, Amsterdam, Florence, Madrid, and Lisbon. RJG

1195. SAKURAI TAKAKAGE 櫻井高景. Application of synthetic resins to the preservation of antiques and art crafts. *Sci. Pap. Japn. Antiques*, no. 1 (Jan. 1951), pp. 25-26.

Application of synthetic resins for the prevention of flaking of pigments of wall paintings and the preservation of burnt wood and wall bodies of Hōryūji temple was studied. Polymethyl-methacrylate for the first and urea resin for the second and third purposes were used. Polyvinyl alcohol was suitable for the preservation of old silks. KY

1196. SAKURAI TAKAKAGE 櫻井高景. Repair of the burnt walls of Golden Hall of Hōryūji temple. *Sci. Pap. Japn. Antiques*, no. 4 (Nov. 1952), pp. 1-7.

The 12 walls on which the Paradise of Buddha and portraits of Bodhisattva were painted were seriously damaged by the fire of 1949. Preservation of pigments remaining on the walls was done with acrylic resin immediately after the fire. All the walls were enclosed in frames and removed from the pillars. The removed wall was laid on a working stand with surface side up, and the wall body was planed away from reverse side with rotary cutter to within 8.5 cm. of the surface. Then urea resin varnish was injected from reverse side to reinforce the body and to join together the surface clay layer and the inner mud layer. Stainless steel bolts were put in the wall from the reverse side and fixed rigidly with urea resin. The restored panels were put back in place with steel fittings. KY

1197. SAKURAI TAKAKAGE, and IWASAKI TOMOKICHI. Scientific treatments made on the Main Hall of the Hōryūji monastery after the fire of 1949. *Bijutsu kenkyū*, no. 147 (1952), pp. 99–107, illus., diags. English summary.

The treatments consisted of: (1) Scorched timbers were impregnated with compound urea resin; (2) fragments of the wall paintings were restored to proper position with urea resin; (3) to prevent separation the layers of the wall were reinforced with urea resin; (4) pigments of the wall paintings were fixed with acryl [acrylic] resin; (5) walls were mounted and removed to facilitate treatment; (6) the backside of the walls were scraped and the mud layer was treated with urea resin; (7) the walls were reinforced with a welded stainless steel lattice; (8) reinforced walls were enclosed in stainless steel frames; (9) Eight scorched wooden doors were planed and stuck together to form four complete doors with urea adhesive. HPS

1198. SAKURAI TAKAKAGE 櫻井高景. Some problems on the preservation of wall paintings using synthetic resins. *Sci. Pap. Japn. Antiques*, no. 2 (Oct. 1951), pp. 29–31.

The results of application of acrylic resin to the wall paintings of Ryōzenji temple, Nara and those of Nijō castle, Kyoto in 1942 were examined in 1951. No color change and flaking of pigments were observed. KY

1199. SCHENDEL, A. VAN. The ICOM Commission for the Care of Paintings and the Problems of Cleaning. *Museum (Paris)*, 4 (1951), pp. 63–66, 1 pl.

Résumé du travail accompli par la Commission de l'ICOM pour le traitement des peintures. PC

1200. SCHENDEL, A. VAN, and MERTENS, H. H. De restauraties van Rembrandt's Nachtwacht. *Oud-Holland*, 62 (1947), 52 pp., illus.

The authors, respectively curator and restorer of the Rijksmuseum, Amsterdam, made a research into the previous treatment of Rembrandt's *Night Watch* and give a full account of the recent cleaning and restoration of the picture. New and important information could be collected from historical documents, as well as from visual observation and photography by infrared and X-rays. PC

1201. SCHRAUBSTADTER, CARL. *Care and repair of Japanese prints*. Cornwall-on-Hudson, N. Y., Idlewild press, c1948. 117 p., illus.

Contents: Preface; General information; Demounting and surface cleaning; Stripping; Spots and stains; Repairing; Inlays or invisible patches; Bleaching; Straightening; "Mizubari" fulling or shrinking; Backing; Mounting; Cataloguing; Solander boxes, portfolios and cabinets; Print sizes. BMU



1202. SCHWEIDLER, MAX. *Die Instandsetzung von Kupferstichen, Zeichnungen, Büchern usw.* 2d ed. rev. Stuttgart, Max Hettler, 1949. 186 pp, 94 illus.

Contents: Allerlei von Restauratoren, ihren Werkräumen und ihren Arbeiten; Probierstube und Inventar; Geschichte des Papiers; Papierbereitung; Wie verschafft man sich alte Papiere? Das Proben von feuchten Papieren; Aufhellung und Ablösung; Ablösung aufgezogener Drucke; Wann darf man mit Chlor arbeiten? Gegenmittel gegen Chlor; Behandlung von einfarbigen Drucken mit Chlorwasser; Chemische Reinigung kolorierter Drucke; Die chemische Behandlung von Farbdrukken; Die Reinigung von Handzeichnungen; Reinigung von Büchern; Wasserstoffsuperoxyd; Die Behandlung von verschiedenartigen Flecken; Entfernung des Spirituslackes; Stärkekleister; Einfärbung, Farbbereitung; Prüfung und Präparierung des Papiers; Allgemeines über Papier; Die eigentliche Flickerei oder Restaurierung; Das Ansetzen eines Randes; Der künstliche Plattenrand; Das Spannen von Stichen; Das Spannen von Zeichnungen auf Keil- oder Blendrahmen; Die Retusche; Behandlung von Chinadrucken, die auf Kupferdruckpapieren aufgezogen sind; Die Behandlung von Autographen; Die Behandlung von Drucken auf Pergament; Chemische Behandlung bemalter Reispapiere; Wiederherstellungsarbeiten an groben Papierformaten; Kleine Winke; Plaudereien über alte und neue Restaurierungen; Die Aufbewahrung und Konservierung von Kupferstichen; Die Aufbewahrung und Konservierung von Büchern; Techniken, auf die es ankommt; Zusätzliche Hinweise für den Briefmarken-Restaurateur.

BMU

1203. SEKULIĆ, ZDRAVKO. La conservation des icones de Lommica, oeuvre de l'iconographe Longin du 16<sup>e</sup> siècle. *Rev. Trav. Protect. Mon. Hist.*, 3 (1952), pp. 85-94, 8 illus.

Altération. Technique opératoire.

PC

1204. SMITH, S. C. KAINES. Dürer's "Madonna of the Iris." *Connoisseur*, 116 (1945), pp. 70-75.

A well-illustrated account of the results of cleaning a Dürer *Madonna* formerly in the Cook Collection and now in the National Gallery. The effect of removing darkened varnish and unnecessarily extensive retouchings is clearly shown in the detail photographs.

SRJ

1205. STOUT, GEORGE L. *The care of pictures.* 2d ed. New York, Columbia university press, 1948. viii, 125 pp.

Contents: Construction of pictures; Surface blemishes; Defects in paint or drawing; Ground; Weakness and damage; Flaws in the support; Housing, handling and moving; Appendices: A, Record abstracts of repair treatment. B, Special means of examination; Bibliography; Index.

Reviewed in: *Antiques*, 55 (Feb. 1949), p. 141; *Art Digest*, 23 (Oct. 1, 1948), p. 28; *Burl. Mag.*, 91 (Ja. 1949), p. 28; *ICOM News*,

(Feb. 1949), p. 12; *Mag. Art*, 42 (Ja. 1949), pp. 34-35; *M.J.*, 48 (1949), p. 223.

Treats illuminated manuscripts and etchings as well as oils and water colors.

"... what [the author] does so effectively is to describe the structure and mechanism of painting and give advice to artists, students, curators and collectors [on] how to keep in as good health as possible the pictures entrusted to their charge. . . . Readers will find [the author's] diagnoses of picture ailments most useful, the chemical causes of darkening, discoloration and decay, how they may be discovered in time, and arrested before disintegration. All these are helped by the ingenious and lucid explanatory diagrams."—*The Connoisseur*.  
BMU

1206. SULZBERGER, S. Le nettoyage des peintures. Le point de vue de l'amateur. *Rev. Univer. Bruxelles*, (octobre-décembre 1950), 6 pp.

Opinions divergentes suivant que l'on adopte le point de vue "scientifique" ou "artistique."  
PC

1207. THOMSON, G. SCOTT. The restoration of the Duke of Bedford's pictures. *Burl. Mag.*, 92 (1950), pp. 320-321.

Bills dated 1742 and 1748 relate to restoration work carried out by one Isaac Collivoe. Items include cleaning, new stretchers, lining, mending, and "taking off the painted spots."  
SRJ

1208. TODD, WILLIAM. Restoring Chinese silk paintings. *Museum News*, Feb. 1, 1952, pp. 5-7.

Paper read at the annual meeting of the American Association of Museums, Chicago, 1949.

1209. ULLAH, MOHAMMAD SANA. Conservation of mural paintings in Central Asia which have been damaged by salt efflorescence. *Mousetion*, 49/50 (1940), pp. 131-136; *C.A.*, 37 (1943), 6056; *Abstract Review*, no. 88 (1944), p. 5.

Mural paintings in the museum of New Delhi, which have been made by mixing ocher, blacking, malachite, green earth and lapis lazuli with hardened mud plaster applied over a layer of gypsum, are subject to damage as a result of the humidity at certain seasons of the year, which causes an efflorescence of salts out of the plaster. The composition of the base makes leaching out by immersion in  $H_2O$  impossible. Impregnation with solutions of cellulose- or vinyl acetate do not prevent the penetration of the moisture. To remove the salts from the plaster layer, a moistening chamber is used which produces a counteracting moisture. In this chamber humidity is maintained above 85 percent. The backs of the tablets were provided with a paper pulp layer 12 mm. thick. To prevent mold formation 15-30 g. of thymene was evaporated in the chamber from time to time and a little phenol was added to the paper paste. The application of the

paper paste was repeated until traces of salts were no longer evident. The tablets were finally impregnated with 5 percent vinyl acetate solution in toluene.

1210. URBANI, GIOVANI. Restauri caravaggeschi per la Sicilia. *Boll. ist. centrale restauro*, 5-6 (1951), pp. 61-91, 21 illus.

Restaurations de tableaux de l'école de Caravaggio, exécutées pour la Sicile: A. Rodriguez, Maître inconnu et Caravaggio. PC

1211. URBANI, GIOVANI. Il restauro degli affreschi di Antonio Solario nel Chiostro del Platano a Napoli. *Boll. ist. centrale restauro*, 2 (1950), pp. 40-43.

Les dégâts sont causés par les conditions locales et aggravés par des traitements antérieurs comportant notamment l'application de cire. A la suite d'essais pour l'enlever, on constate que la "triéline" en est le meilleur solvant. FD

1212. VAN DANTZIG, M. M. De restauratie van de "Nachtwacht." *Phoenix (Amsterdam)*, 1 (1946/47), pp. 12-15, 1 pl.

Généralités sur la restauration récente de la "Ronde de Nuit" de Rembrandt. Résultats obtenus. PC

1213. VAN DANTZIG, M. M. Schilderijenschoonmaak in de National Gallery. *Phoenix (Amsterdam)*, 2 (1947/48), pp. 292-297, 3 illus.

Considérations d'ordre technique sur le nettoyage des tableaux à la National Gallery de Londres. PC

1214. WATT, ALEXANDER. The rebirth of the Louvre. *Apollo (London)*, 44 (1946), pp. 141-144, illus.

An account of emergency protection of works of art in France during World War II and the activities of the Louvre group of restorers in cleaning paintings during that period. RJG

1215. WEAVER, J. R. H., STOUT, GEORGE L., and COREMANS, PAUL. The Weaver report on the cleaning of pictures in the National Gallery. *Museum (Paris)*, 3 (1950), pp. 113-135, illus.

A shortened version of the Weaver Report on the safety and effectiveness of cleaning methods and materials used in the National Gallery covering three of the ten paintings which were the subject of the original confidential inquiry. The paintings considered in detail are Rembrandt's *A Woman Bathing*; Rubens' *Le Chapeau de Paille*, and Velasquez' *Philip IV When Elderly*. In each case criticisms which had been made in the correspondence columns of *The (London) Times* are summarized. A full account is given of the technical examination made and of the records of treatment. Forty-two diagrams and technical photographs are reproduced. SRJ

1216. WEHLTE, KURT. Probleme der Gemäldeerhaltung. *Z. Kunst.* (1949), pp. 90-104, 3 illus.

Importance de la restauration des tableaux. Généralités et problèmes particuliers, notamment les retouches, les vernis originaux, la régénération. Les travaux de la National Gallery. Nécessité d'une collaboration internationale et de la création d'écoles des restauration. PC

1217. WETE. Restoration of old paintings. *Farben-Ztg.*, 47 (1942), p. 6.

A description of the surface characteristics of old fresco paintings and the procedure for their restoration. AEW

1218. WILLEMSSEN, ERNST. *Museale Gemälde restaurierung*. Düsseldorf, Kunstsammlungen der Stadt, 1950. 16 pp., 5 illus.

Considérations générales sur le traitement des tableaux anciens. Quelques problèmes particuliers, notamment celui du dévernissage et celui du repeint ou surpeint. Exemples d'oeuvres restaurées à la Galerie de Düsseldorf. PC

1219. WYROUBAL, ZVONIMIR. La restauration des tableaux en Croatie. *Rec. Trav. Protect. Mon. Hist.*, 2 (1951), pp. 63–68.

Construction et aménagement d'un Institut de restauration à l'Académie yougoslave des Sciences et des Arts. PC

1220. WYROUBAL, ZVONIMIR. Trois tableaux restaurés dans l'Institut de restauration de l'Académie yougoslave de Zagreb. *Rec. Trav. Protect. Mon. Hist.*, 3 (1952), pp. 75–84, 6 illus.

Détails historiques et techniques sur la restauration d'une peinture à tempera de Nikola Božidarević (15e s.) et de deux tableaux à l'huile de David Teniers (17e s.) et de Josip Račić (20e s.). PC

1221. Yale university. Art gallery. *Rediscovered Italian paintings*. New Haven, Yale university art gallery, 1952. 39 pp., illus.

This is a catalogue of 14 paintings of the Jarves Collection at Yale which have recently undergone cleaning. Included with technical notes on each painting are illustrations of details showing the before and after condition. RJG

1222. ZILVA, C. Signatures and dates on Rembrandt's paintings (letter to the editor). *Apollo (London)*, 42 (1945), p. 191.

Approves the removal of the spurious date and signature on Rembrandt's *The Woman Taken in Adultery* in the National Gallery, and of cleaning policies there in general. RJG



## V. SCULPTURE

1223. HOMMA MASAYOSHI. *Sokugibo*, an ancient method of image-making. *Kokka*, no. 723 (1952), pp. 185-193, tables, diagrs. English summary.

A study of the technique of *sokugibo* used in the making of dry lacquer sculpture in the Nara period with particular reference to the images which were once in the Kondō of the Hōkeji temple. In the *sokugibo* technique the image is constructed of layers of hemp cloth and lacquer. The author infers that the various techniques can be identified by measurement of the thicknesses and includes tables of his measurements with diagrams of structures. A comparison is also made with other lacquers known as *tsuchi-urushi*, *sumi-urushi*, and *samoku-tsuchi-urushi*. HPS

1224. LEFÈVE, RENÉ. Het wetenschappelijk onderzoek van de polychromie van houten standbeelden. *Tijdspiegel*, 2 (1947), pp. 129-132, 5 illus.

L'examen scientifique des sculptures polychromées est indispensable avant leur traitement. Exemple: *Vierge et Ste Anne* (début 16e s.). PC

1225. MATSUMOTO EIICHI. The modeling of Buddhist images by the use of molds. *Bijutsu kenkyu*, no. 156 (1950), pp. 1-15, illus., pls.

There are at Tun-huang and other ancient Buddhist sites of eastern Turkestan many clay statues made by the use of molds for mass production. Some are made by single molds, others by joining the parts separately modeled. Interesting variations were produced by differences in coloring, in accessories, and in methods of joining the parts. The murals of the Main Hall of the Hōryū-ji temple at Nara, Japan appear also to have some sort of moldwork. HPS

1226. ŌHASHI KICHINOSUKE 大橋吉之助. Repairs of some old sculptures. *Chem. Eng. Digest*, 19 (1951), pp. 51-54.

Falling off of Japanese lacquer and pigments of wooden sculptures of 11-14th century was prevented by the injection of synthetic resins. 15-35 percent solutions of co-polymers of methacrylic and vinyl resins were used. Solution of pentachlorophenol was used as the insecticide. To make copy of the sculpture with gypsum, tin foil was put on the original sculpture with paste made of sodium alginate and ethylene glycol. KT

1227. PUTNAM, BRENDA. *The sculptor's way; a guide to modelling and sculpture*. Rev. ed. New York, Watson-Guptill Pub. Inc., 1948. 357 pp., illus.

Contents includes: Introduction . . . Ceramic sculpture, by Carl Walters; Stone and marble carving, by Robert A. Baillal; Wood carving, by Glea Derijinsky; Bronze casting, by Anton Basky; Conclusions; Suggested reading; Index. BMU

1228. RICH, JACK C. *The materials and methods of sculpture*. New York, Oxford, 1947. 416 pp. 62 pls., illus.

Contents: Preface; The anatomy of sculpture; The plastic earths; Plastic wax; Plaster of Paris; Casting; Metal; Surface treatment of metals; Stone; Sculpture in stone; Wood; Other sculpture materials; Appendix; Bibliography; Glossary; Index.

Reviewed in: *Mag. Art*, 41 (1948), p. 243.

BMU

1229. RICHTER, GISELA M. A. The drove. *Amer. J. Archaeol.*, 47 (1943), pp. 188-193.

The striations on the sides and backs of archaic Greek stelae were not caused by a saw but by the use of a broad chisel known as the drove. ERC

1230. RIGAL, JOSEPH L. Preparing, painting, and ornamenting church statuary. *Ind. Finishing (London)*, 27, no. 2 (1950), pp. 51-52, 54; *Abstract Review*, no. 167 (1951), p. 87.

The steps used in painting and in applying gold and silver leaf to church statuary are given.

1231. ROSEN, DAVID. The preservation of wood sculpture: The wax immersion method. *J. Walters Art Gallery*, 13/14 (1950/51), pp. 45-71.

The author has been using wax immersion since 1935 to correct powdery or insect-damaged wood and chalky gesso as they occur in painted wood panels. The method has been adapted to the more complex problems of polychrome wood sculpture. Objects are immersed in a large tank of molten wax until the wax has penetrated all porosities. Beeswax plus 25 percent gum elemi to improve adhesiveness has generally been used. Without the use of complex surgical techniques, the treatment consolidates the components of objects so that they may be handled safely. Among 30 pieces of polychrome sculpture so treated were two very large altarpieces that were treated disassembled. The author feels that the method is no longer experimental, but safe, practical, and effective. RDB

1232. ZORACH, WILLIAM. *Zorach explains sculpture, what it means and how it is made*. New York, American Artists Group, c1947. 302 pp., illus., pls.

Contents: Introduction to sculpture; Approach to sculpture; Form in art; Proportions: Anatomy; Rhythm; Design; Working with clay; Modelling a head; The study of planes; Heads in art; Building a figure in clay; Plaster casting—Waste mould; Piece mould and gelatine

mould; Stone casting; Lost wax casting; Sand casting; Patines for plaster casts; Bronzes in art; Wood carving; Wood sculpture; Stone carving; Handling stone; Sculpture in stone; Sculpture competitions; Sculpture today; Appendix (Supply houses of materials); Index (Artists, countries, and periods).

Reviewed in: *Amer. Artist*, 12 (1948), p. 48; *Art Digest*, 22 (Feb. 1, 1948), p. 29; *Art News*, 47 (Mar. 1948), p. 51; *Mag. Art*, 41 (1948), p. 243-244. BMU

### W. FURNITURE

1233. DAVIDSON, RUTH BRADBURY. The ABC's of nails and screws. *Antiques*, 55 (Mar. 1949), p. 189.

Only wrought-iron nails were available until about 1800, when cut nails began to be made. The latter had irregularly shaped, hammered heads until about 1825, when cut nails were made in one operation by water-powered machinery that cut the nail, clamped it, and stamped the head. The earliest of these nails had thin lopsided heads, but by 1830 the heads were thick and regular.

Wood screws were made earlier than is generally realized. In English furniture the use of tapering brass screws with slotted heads dates from the 1600's. They were first imported and used in America about 1725. They were produced mechanically in the early 1800's, but the pointed end was not introduced until the midcentury. EHJ

1234. HINCKLEY, F. LEWIS. *A directory of antique furniture*. The authentic classification of European and American designs for professionals and connoisseurs. New York, Crown Publishers, 1953. 432 pp. with 1103 illus.

Contents: Preface; Interrelation of furniture designs; The spread of French and English design influences: Germany, Liege, and Aix la Chapelle, Austria, Denmark, Danish West Indies, Bermuda, Sweden, Norway, Russia, Holland, Dutch Colonies China and the Philippines, Ireland; Structural methods and materials; Illustrations. BMU

1235. LORINI, M. CAMPBELL, and WILLIAMS, HENRY LIONEL. *How to restore antique furniture*. New York, Pellegrini & Cudahy, 1949. 214 pp., illus.

Contents: The purpose and practice of restoration; The old-time cabinet maker; The workshop, tools and materials; Patching and jointing; Restoring chairs; Restoring tables; Chests, bureaus and desks; Restoring and modernizing beds; Handles, hinges and fastenings; Fix-

ing old clocks; The art of refinishing; Fakes, fakers and reproductions; Suggested equipment for the small shop; Glossary; Suggested reading; Index; Appendix. BMU

1236. SYMONDS, R. W. The craft of the English joiner; its construction and material. *Connoisseur*, 118 (1946), p. 98.

Gives details *inter alia* of the history of joints, nails, timber conservation, and selection. SRJ

## X. BUILDINGS AND MONUMENTS

1237. BAKOS, L. Better organization of the care of artistic and historical monuments. *Pam. a muz.*, 1, no. 1 (1952), pp. 1-4.

1238. BURGESS, S. G., and SCHAFFER, R. J. Cleopatra's Needle. *Chem. & Ind.* (1952), pp. 1026-1029.

Review of the condition of Cleopatra's Needle (London) and the process of cleaning and treatment of the surface. Technical, thorough, up-to-date report. RLF

1239. CHAKRAVARTI, N. P. Restorations to the intrados of the Gol Dumbad. *Museum (Paris)*, 3 (1950), pp. 325-327.

This great mausoleum in India, which covers an area of 181,110 square feet, is without intermediate support, and it has the largest dome roof in the world. It was built 1627-1656. Now after three centuries it is showing signs of decay; iron hooks and clamps used in the dome are rusting and disrupting the brickwork; mortar is deteriorating and cracking. After grouting the cracks it has been stabilized with a thin shell of "gunite"  $2\frac{1}{2}$  inches thick, and the dome has been hooped with steel rings below the plane of rupture. The interior of the base (intrados) was strengthened with steel reenforced panels  $4\frac{1}{2}$  inches thick. RJG

1240. FISKOVIC, CVITO. La conservation et la restauration des monuments en Dalmatie. *Rec. Trav. Protect. Mon. Hist.*, 2 (1951), pp. 143-166, 5 illus.

Compte rendu de l'activité en matière de restauration, de l'Institut de Conservation pour la Dalmatie. FD

1241. GUNTHEROVA, A. The task of protecting historical monuments in Slovakia today. *Pam. a muz.*, 1, no. 1 (1952), pp. 5-17.



1242. LIBERTI, SALVATORE. Note sulle condizioni della Basilica Sotterranea di Porta Maggiore. *Boll. ist. centrale restauro*, 3-4 (1950), pp. 122-133.

La description du monument; des recherches et analyses chimiques et physiques montrant l'action corrosive de l'humidité; les observations sur la restauration et la consolidation. FD

1243. MATTHEWS, DEREK H. The restoration of the Monastery Church of Debra Damo, Ethiopia. *Antiquity*, 23 (1949), pp. 188-200.

Detailed descriptions with diagrams of the construction of a sixth-century church. IG

1244. NENADOVIĆ, S. M. La restauration de l'église de Notre-Dame de Ljevišā à Prizren. *Rec. Trav. Protect. Mon. Hist.*, 3 (1952), pp. 39-50, 14 illus.

L'enlèvement d'un mortier du XVIII<sup>e</sup> siècle, recouvrant les murs extérieurs et intérieurs, a permis de dégager de nombreuses fresques et des façades polychromes avec éléments plastiques en céramique. FD

1245. The preservation of ancient monuments. *M.J.*, 52 (1952), pp. 271-273.

A brief description of the functions and responsibilities of the Ancient Monuments branch of the Ministry of Works of Great Britain. Most important is the preservation of buildings. At present about 100 skilled craftsmen, chiefly masons, with attendant laborers are working on the preservation of existing remains in England and Wales. RJG

1246. SOFIANOPOULOS, ATHANASIOS J. Conservation of ancient marble monuments. *J. Chem. Educ.*, 28 (1951), pp. 79-81; *C.A.*, 45 (1951), 4975i.

Chief cause of deterioration of weather-exposed marble is a layer of dust containing clay, SiO<sub>2</sub>, soot, and vegetable matter in areas protected from driving rain. This colloidal layer absorbs SO<sub>2</sub> and oxides of N to form acids which attack the marble. Deterioration is not caused by oxidation of ferrous Fe or from CO<sub>2</sub> in water, as is commonly supposed because action is always local. Best means of conservation is periodic washing. Ancient Greek lime mortars in which colloidal material was incorporated have shown outstanding permanence. RJG

1247. VARS, M. S. Repair of the Taj Mahal. *Anc. India*, no. 1 (Jan. 1946), pp. 4-7, illus.

After reviewing the history of repairs to the building the recommendations of the Advisory Committee to Archaeological Survey of India are listed. "The report indicates that whilst much minor repair

work of a somewhat costly kind is necessary and should not longer be delayed the Taj is not in imminent danger of collapse and may not be essentially in very much worse structural condition than when Prince Aurangzeb submitted his adverse report nearly three centuries ago." RJG

1248. Venezia. Soprintendenza ai Monumenti. *Mostra del restauro di monumenti e opere d'arte danneggiate dalla guerra nelle tre Venezie*. Venezia, 1949. 205 pp., 100 illus.

Catalogue: Restauration de monuments, de peintures, d'antiquités dans les régions de Venise, Vérone, Trente, Trieste, Padoue, Vincenza, Treviso, Bolzano, Udine, Pola. RL

1249. VULOVIĆ, BRANISLAV. Les monuments historiques de la région de Toplica et leur conservation. *Rec. Trav. Protect. Mon. Hist.*, 3 (1952), pp. 51-62, 12 illus.

Consolidation au moyen de béton armé de deux anciens monuments; restauration des vestiges d'un monument religieux, récemment mis à jour et remontant à la Basse Antiquité. Découverte de fresques importantes (fin XII<sup>e</sup> siècle) au cours des travaux. FD

## TECHNICAL EXAMINATION OF OBJECTS AND ANALYSIS OF MATERIALS

### A. CHEMICAL ANALYSIS (INCLUDING MICRO-, SPECTRO-, AND CHROMATOGRAPHIC ANALYSIS)

1250. AUGUSTI, SELIM. Sul riconoscimento microchimico del catione Pb<sup>++</sup> nei colori minerali a base di piombo. *Mikrochemie ver. Mikrochim. Acta*, 30 (1942), pp. 237-240; pp. 273-275.

A series of articles in this journal on the microchemical identification of mineral pigments in paintings. The latter concerns principally the detection of chromium in chrome pigments. Title varies. RJG

1251. AUGUSTI, SELIM. Sulla sensibilità della reazione con solfuro sodico, per il riconoscimento microchimico dei cationi piombo ed antimonio. *Annali chim. (Rome)*, 36 (1946), pp. 105-109.

Proposition d'application de la réaction microchimique au sulfure de sodium non uniquement à la détermination du plomb mais également de l'antimoine caractéristiques de certains pigments minéraux. JT

1252. BLOCK, RICHARD JOSEPH. *Paper chromatography; a laboratory manual*. New York, Academic Press, c1952. 195 pp., illus., tables.

Contents: Foreword; Introduction; Theory; General methods; Quantitative methods; Amino acids; Amines and proteins; Carbohydrates; Aliphatic acids and steroids; Purines, Pyrimidines, and related substances; Phenols, aromatic acids, and porphyrins; Miscellaneous organic substances; Antibiotics and vitamins; Inorganic separations; Bibliography; Author index; Subject index. BMU

1253. BONTINCK, ED. *Chimie et microchimie appliquées à l'examen des peintures artistiques*. *Chim. peintures*, 8 (1945), pp. 195-201; 258-261, 286-289, 318-320, illus., diagrs., table.

In the late eighteenth century chemical analytical methods were first employed in the study of early painting materials. One, de Morrona, wrote on the index of his book (1787) "Per l'utilità di chimici sperimenti sulle pitture antiche." Early chemical investigations into the materials and methods of ancient painting are reviewed. Modern methods are discussed in some detail covering: laboratory, equipment, taking of specimens from paintings, making of cross sections, separation of mediums from pigments, and the identification of mediums. There is a scheme for the systematic identification of mediums of wall paintings. The last section is given to the microchemical identification of 18 chemical elements that make up most of the pigments. Sixty-five references. RJG

1254. BONTINCK, ED. The examination of mural paintings. *Natuurw. Tijdschr. (Belg.)*, 23 (1941), pp. 97-109; *C.A.*, 37 (1943), 6473; *Abstract Review*, no. 88 (1944), p. 35.

Microchemical reactions are given for the analysis of adhesives and dyes, determination of N, S, and P in adhesives containing N (egg white, egg yellow, and casein), gum arabic, resins, linnoxyn (black spots on treatment with 1 percent aqueous  $\text{OsO}_4$  solution; detection of glycerol), wax, starch flour in N-free adhesives, and of Ca, Pb, Zn, Fe, Mn, Cu, Hg, and S in dyes. A table shows the scheme of analysis for the examination of adhesives. The necessary apparatus, solvents and reagents are listed.

1255. BONTINCK, ED. Microchemical analysis of the wall paintings of St. Baafsabtei in Ghent (about 1175). *Mededeel. Koninkl. Vlaam. Acad. Wetenschap. Belg. Kl. Wetenschap.*, nr. 13 (1940), pp. 3-12; *C.A.*, 37 (1943), 3953; *Abstract Review*, no. 85 (1943), p. 157.

$\text{CaCO}_3 + \text{Ca}(\text{OH})_2$  in admixture with casein, lapis lazuli, yellow and red ocher, burnt sienna, glauconite, and powdered wood charcoal were identified, but the following pigments were not detected: white lead, cinnabar, and blue and green Cu pigments. The method previously given for the determination of lapis lazuli is not applicable in

the presence of casein.  $\text{Ca}(\text{OH})_2$  and casein, and also glue, were used as the principal binding agents for black pigments. The presence of casein is indicated also by its resistance to dilute  $\text{HCl}$ , by which method the presence of organically bound P, N, and S was determined, particularly of P, for which the silicates were removed with  $\text{HF}$  and  $\text{H}_2\text{SO}_4$ . The presence of casein was confirmed by testing in ultraviolet light, wherein I causes the fluorescence of casein to disappear.

1256. BONTINCK, ED. Van chemische tot microchemische analyse in dienst van de geschiedenis der schilderkunst. *Gentsche Bijdragen Kunstgesch.*, 8 (1942), pp. 37-48.

Chemical analysis was the first of the scientific methods applied to the examination of works of art. There are two analyses dating from the eighteenth century. In 1863 the first microscopic examination of a fragment of painting was made in Munich. In the early twentieth century W. Ostwald reported on the first microchemical analyses of binding mediums. Since then notable progress has been made in microchemical methods. Extended bibliography covering the writings of 20 investigators.

RJG

1257. BRASSEUR, H., DALLEMAGNE, H. J., and MELON, J. Chemical nature of salts from bones and teeth and of tricalcium phosphate precipitates. *Nature (London)*, 157 (1946), p. 453.

It is possible, with accurate quantities of citric acid, to separate chemically the carbonate of bone from the phosphate without destroying the latter. Hence, bone salts are a physical complex of the two. The effect of ignition is discussed. The refractive index of bone salts is equal to that of a mixture of 90 percent pure *alpha* tricalcium phosphate with 10 percent calcium carbonate, namely 1.590; after ignition the value of the refractive index becomes equal to that of the natural namely, 1.649. The mineral fraction of ivory and cement from tooth is the same as that of bone, enamel having a more complex composition.

LB

1258. CONSDEN, R. Partition chromatography on paper, its scope and application. *Nature (London)*, 162 (1948), p. 359.

A review of the applications of partition chromatography since its inception by the author *et al.* in 1944. The bibliography contains 51 titles.

SRJ

1259. CROSSLEY, H. Some aspects of paint analysis. *J. Oil Col.*, 29 (1946), pp. 292-295.

A miscellany of analytical methods which the author has found applicable to paint constituents.

SRJ

1260. DOORSELAER, M. VAN. Quantitative spectrochemische analyse van oude bronzen. *Verhandel. Koninkl. Vlaam. Acad. Wetenschap. Belg. Kl. Wetenschap.*, 12, n° 35 (1950), 27 pp., 20 illus.



Nouvelle microméthode spectrochimique. Sont décrits: l'aspect du problème, la forme d'émission, les régions circonscrites, les conditions de travail, les courbes de références. Quelques tableaux d'analyse de haches anciennes montrent des résultats comparatifs avec les analyses chimiques de Jacobsen (1905). DG

1261. DREYWOOD, ROMAN. Qualitative test for carbohydrate material. *Ind. Eng. Chem., Anal. Ed.*, 18 (1946), p. 489; *C.A.*, 40 (1946), 5668.

To 1 mg. of sample in a small test tube add 2 ml. of 0.2 percent anthrone (Meyer, *C.A.*, 22, 1586) in concentrated  $H_2SO_4$ . If carbohydrate is present, a clear green color will be seen, quickly becoming a dark blue-green. Other organic material usually gives a brown color. The test is useful for the detection of carbohydrate and for the preliminary classification of resins. When used to detect starch, the test is 10-40 times as sensitive as the I test.

1262. EVANS, BERNARD SCOTT, and HIGGS, D. G. Spot tests for the detection of alloying elements in: Steel. *Analyst*, 70 (1945), pp. 75-82.

Nondestructive methods for showing the presence of copper, lead, nickel, and nine other metals in steels, sensitive down to 0.1 percent; Zinc-base alloys: *Ibid.*, 72 (1947), pp. 101-105. Nondestructive methods of testing for copper, aluminium, antimony, tin, cadmium, and lead; Lead-base alloys: *Ibid.*, 72 (1947), pp. 105-109. Nondestructive methods of testing for tin, antimony, cadmium, silver, arsenic, and bismuth; Tin-base alloys: *Ibid.*, 72 (1947), pp. 439-443. Nondestructive methods of testing for lead, copper, arsenic, antimony, zinc, and aluminium; Copper-base alloys: *Ibid.*, 75 (1950), pp. 191-201. Nondestructive methods of testing for zinc, tin, iron, lead, arsenic, cadmium, and eight other elements, including phosphorus. LB

1263. EVANS, BERNARD SCOTT, and HIGGS, D. G. *Spot tests for the identification of certain metallic coatings and of certain metals in bulk.* Cambridge, Heffers for the Society of Public Analysts, 1943, 24 pp.

1264. EWART, M. H., and CHAPMAN, R. A. Identification of stabilizing agents. *Anal. Chem.*, 24 (1952), pp. 1460-1464, tables.

A method is described for the identification of stabilizing and thickening agents used in food products including gum tragacanth, starch, gum arabic, gelatin, and others. The proposed identification scheme is based on precipitation reactions with calcium chloride, sodium hydroxide, barium hydroxide, and lead acetate. (Some of these reactions might be useful in the microchemical identification of the mediums of paintings.) RJG

1265. GILLIS, J., DOORSELAER, M. VAN, and RAMÍREZ-MUÑOZ, J. Spectrographic analysis of some archaeological bronzes on the micro scale. *Anales real soc. españ. fis. y. quim.*, 47B (1951), pp. 609-618; *C.A.*, 46 (1952), 2959d.

Technique published earlier (*C.A.*, 45 (1951), 2367a) is described in detail. Analysis of the residue insoluble in aqua regia shows Sn and Si. Solutions containing precipitants or colloids give erroneous results.

1266. HAYASHI KŌZŌ 林孝三, ISAKA TACHIKO 猪坂多智子, and SUZUSHINO GEN. 涼野元. Chemical identification of vegetable dyestuffs printed on ancient Japanese silk-wares. *Sci. Pap. Japn. Antiques*, no. 1 (Jan. 1951), pp. 33–42.

Extraction of dyestuffs by organic solvents and the application of paper chromatography to the identification were studied. Chemical properties of following pigments contained in plants were given: berberin, luteolin, curcumin, crocin, rutin, fustin, pseudopurpurin, alizarin, carthamin, brasilein shikonin, and indigo. Preliminary report.

KY

1267. JONES, S. I. M., and MICHAEL, S. E. Chromatography of proteins. *Nature (London)*, 165 (1950), p. 685.

Acid dyes such as "Solway Purple" are useful in the demarkation of proteins on the developed paper chromatographs and cellulose columns since they do not stain cellulose.

SRJ

1268. JURANY, H. Ein neuer spezifischer Nachweis von Zinn (als  $\text{SnJ}_4$ ). *Mikrochemie ver. Mikrochim. Acta*, 34 (1949), pp. 412–417.

A microreaction for the specific identification of Sn is described in which Sn is precipitated as  $\text{SnJ}_4$  (yellow crystals of the regular system). The test may be confirmed in the same drop, viz., by the formation of black octahedra of  $\text{CsSnJ}_6$ . Limit of identification of both reactions: 0.02% Sn. Possibilities of interference and a procedure for the isolation of Sn are discussed. (Test probably useful for the microchemical detection of Sn in alloys and pigments.)

—Author's English summary.

1269. LEDERER, MICHAEL. Paper chromatography of the noble metals. *Nature (London)*, 162 (1948), p. 776.

RMO

1270. MALISSA, HANNS. Mikromethoden zur Gemäldeuntersuchung. *Mikrochemie ver. Mikrochim. Acta*, 35 (1950), pp. 34–55. English summary.

The essential result of this study is the separation scheme given in Table 2, which permits the detection, in a single analytical procedure, of the 20 most important and most frequent elements used by artists. When not indicated by literature references, other detection reactions were mentioned; the "Feigl" spot reactions were drawn on to the fullest extent. Thus a further proof was given that it is entirely possible to accomplish entire separation procedures on a microscale more rapidly and more simply than by macroanalytical methods. The "acro-reactions" given by G. Skalos were employed to lower the sensitivity limits

still more. When a filtration was necessary, the "Gorbach" procedure was used. A tabular review of the possible chemical composition of the pigments together with chronological data is also given to facilitate the detection of the characteristic ions. Twenty-two references.  
RJG

1271. MALISSA, HANNS, and SPITZY, H. Praktische Anwendung der Mikromethoden in der Gemäldeuntersuchung. *Mikrochemie ver. Mikrochim. Acta*, 35 (1950), pp. 302-305.

A report is given of the microchemical examination of an important cultural historical fresco painting from the years 1740/42 and also of the restoration made on it in 1929 and 1949. These studies served to clear up definitely some damage that recently appeared on the painting.  
—Author's English summary.

1272. MILLS, J. S., and WERNER, A. E. Paper chromatography of natural resins. *Nature (London)*, 169 (1952), p. 1064, illus.

Dammar, mastic, sandarac, rosin, elemi, and copal each give a characteristic chromatogram. Working details are given.  
RJG

1273. PICCARDI, GIORGIO. Spectroscopy, archaeology, and metallurgy. *Spectrochim. Acta*, 5 (1952), pp. 73-76; *C.A.*, 47 (1953), 996a.

The possible scope of spectrochemical analysis in its application to the unsolved problems of archaeology and of ancient foundry techniques is outlined.

1274. RIBAS, IGNACIO, and BARDANCA, ELISEO S. Resultado de los análisis de la tierra de un gran sarcófago hallado en la Santa Iglesia Catedral de Santiago de Compostela. *Bol. Univ. Santiago Comp.*, nos. 49-50 (1947), pp. 5-35.

An extensive qualitative and quantitative examination of a sample of a dark earthy material found among the bones in an ancient sarcophagus, and a comparison of the results with those similarly obtained on a sample of the exterior soil, indicated that the earthy material had been produced by the infiltration of exterior soil and the admixture of this with decomposition products from the human remains and with material dissolved by ground water from the interior of the sarcophagus itself.  
ERC

1275. ROCHOW, T. G., and STAFFORD, R. W. First annual review of analytical chemistry. *Anal. Chem.*, 21 (1949), pp. 196-202.

One of 29 articles in the "First Annual Review of Analytical Chemistry" for 1948. Covers high polymeric materials, oils, pigments, and waxes with 108 references.  
RJG

1276. SCHUSTER, H., and ZEIDLER, G. Application of the Storch-Morawski reaction to synthetic resins, particularly to polyvinyl ether and polyvinyl acetate. *Farben-Ztg.*, 48 (1943), pp. 37-39; *Chem. Zentr.*, Pt. 2 (1943), p. 680; *C.A.*, 38 (1944), 4718.

Artificial resin is dissolved by heating in 1 cc.  $\text{Ac}_2\text{O}$ , cooled (with water, if necessary), and treated with three drops of 89 percent  $\text{H}_2\text{SO}_4$ . The following characteristic colors were obtained: polyvinyl ether, blue and green; polyvinyl acetate, blue; ketonic resins and coumaron resins, wine red. Igevin M (0.005 percent) and Igevin A (0.01 percent) gave a blue color. Polyvinyl acetate did not produce a color on cooling. The color reactions of numerous synthetic resins are tabulated.

1277. SCRIBNER, BOURDON F., and BALLINGER, JOHN C. Spectrochemical analysis of bronze by a porous electrode method. *J. Res. Nat. Bur. Stand.*, 47 (1951), pp. 221-226.

Method for analysis of statuary bronze (3Sn, 3Zn, 2Pb, 2Ni, 90 Cu) given. RLF

1278. VIGNOLA, TERENCE. *Analisi dei pigmenti minerali*. Milano, Editoriale italiana, 1947. 201 pp. (Collezione di monografie tecniche chimiche. 10). Bibliography: p. 202.

Reviewed in: *Peintures, pigments, vernis*, 24 (1948), p. 319.

1279. WEST, PHILIP W., and HAMILTON, WILLIAM C. Specific spot test for antimony. *Anal. Chem.*, 24 (1952), pp. 1025-1026; *C.A.*, 46 (1952), 9462g.

For a sensitive and specific test for Sb, extract tetraiodoantimonate (III) ion with benzene and treat with Rhodamine B.

1280. WILLIAMS, TREVOR ILLTYD. *An introduction to chromatography*. London & Glasgow, Blackie & Son, Ltd., 1946. 109 pp., 8 pls.

Contents: The principles of chromatography; Chromatographic methods—adsorbents, solvents, and eluents; The chromatography of colorless substances; The chromatography of inorganic substances; Partition chromatography; Examples of the use of chromatography; Theoretical considerations; Bibliography; Index.

Reviewed in: *Nature (London)*, 158 (1946), p. 730, by E. Lester Smith under the title: Chromatography for beginners. LB

## B. MICROSCOPY AND PHOTOMICROGRAPHY

1281. BILLMEYER, FRED W. Measurements of the refractive index of films. *J. Appl. Phys.*, 18 (1947), pp. 431-434; *C.A.*, 41 (1947), 4693.

A method similar to the mineralogical immersion technique is described. The test specimen need have only one reasonably plane face, and need not be transparent. Mixtures suitable for making measure-



ments on plastics are benzyl alc.,  $\text{CCl}_4$ , and EtOH in various proportions. Refractive indexes obtained on a few specimens were: polythene 1.515 and 1.519 (2 different lots), "Teflon" 1.378 (d.2.18) and 1.376 (d.2.12), and nylon 1.532.

1282. BRISON, R. J. A method for the preparation of polished thin sections of mineral grains. *Amer. Mineral.*, 36 (1951), pp. 731-735; *C.A.*, 47 (1953), 1213*b*.

A single layer of sized grains is mounted in a film of plastic on a flat surface of the same plastic. The layer is ground to the center of the grains, and the ground surface is remounted on more of the same plastic. The original piece of plastic is then cut off, and the other side of the layer of grains is ground until they are of the desired thickness. The surface is then polished, and the specimen can now be examined by either reflected or transmitted polarized light.

1283. BROADFOOT, H. H., and SCHWARZ, E. R. An improved permanent mounting medium for textile fibers. *Textile Res. J.*, 18 (1948), pp. 756-758; *C.A.*, 43 (1949), 1570.

By the combination of a synthetic resin of a moderately low  $n$  with a compatible plasticizer of a much higher index, a colorless permanent mount for textile fibers can be made which has the desired refractive index. Isobutyl methacrylate polymer of refractive index 1.48 and Aroclor 1242 of refractive index 1.62 were used as resin and plasticizer, respectively. Formula for mounting medium: xylene (filtered) 21 ml., Aroclor 1242 9 ml., and isobutyl methacrylate polymer 18 g. The procedure is outlined and data tabulated for photomicrographs of various fibers mounted in various mounting media.

1284. CALEY, EARLE R. Technique for obtaining uncontaminated small samples of ceramic glazes and other hard siliceous materials. *Anal. Chem.*, 19 (1947), p. 360 (note).

A tungsten carbide pencil is used to make a series of short parallel scratches so that sufficient glaze is removed in the form of a powder and minute chips to provide samples for analysis. Working under a magnifying glass the depth of the scratches can be controlled, so as to avoid cutting through the glaze. It provides directly a finely divided sample ready for weighing. RJG

1285. CLAY, H. F. Cutting sections of paint films. *Paint. Tech.* (1949), pp. 298-299; *Abstract Review*, no. 154 (1950), p. 54.

A technique for embedding paint films in wax and sectioning them for microscopic examination is described.

1286. DAVIDSON, J., and TAYLOR, W. D. Staining of mammalian hair. *J. Quekett Microscop. Club*, Ser. iv, no. 1 (1943).

Research item in *Nature (London)*, 154 (1944), p. 241, where some details are given of a technique for treatment to facilitate the study particularly of the cuticular scales, which seem to be distinctive for each species. LB

1287. DAVIS, H. L., and RYNKIEWICZ, H. J. A fiber identification stain. *Ind. Eng. Chem., Anal. ed.* 14 (1942), p 472; *C.A.*, 36 (1942), 4342.

To supplement a National Bureau of Standards recommendation (*C.A.*, 33, 4429) of dye systems for identifying rayons, a solution containing acid fuchsin (Color Index no. 692), 6g.; picric acid, 10 g.; tannic acid, 10 g.; and National Soluble Blue 2B extra (Color Index no. 707), 5 g., all in one liter of solution, is prepared. Momentary immersion in the hot solution, or 2-minute treatment in the cold solution, and rinsing, yield colors as shown: cotton or linen, light blue; acetate or nylon, pale greenish yellow; cuprammonium, dark blue; viscose, lavender; vinyon, very pale blue; wool, yellow; silk (raw), black; silk (degummed), brown. Films of cellulose acetate or viscose (cellophane) respond to the same tests as above.

1288. DIFFENBACH, FERD. Microscopic inspection of cross-sectional areas of coated surfaces such as those carrying paint film. *U. S. Patent* no. 2,290, 170, July 21, 1942; *C.A.*, 37 (1943), 542.

Apparatus is described, and a method is employed for determining the adhesive qualities of coated surfaces which involves coating a common plane surface of two adjoining detachably connected inspection blocks, allowing the coating to dry, separating the blocks to fracture the coating along the line of jointure of the blocks and placing a cross-sectional area of the divided coating in the field of a microscope for inspection of the internal structure of the coating along the ruptured edge.

1289. DOLLAR, A. T. J. Cellulose acetate mounts for rock and mineral fragments. *Nature (London)*, 153 (1944), p. 226.

Rock or other powders, embedded in a thin film of cellulose acetate while it is drying, may be microscopically examined or transported easily and safely, and particles of special interest can be marked or cut out without destroying the whole mount. LB

1290. DUNN, E. J., JR. Microscopy in the paint industry. *Off. Dig.*, no. 247 (1945), pp. 288-299; *Review*, 18 (1945), p. 310.

The concept of particle shape and its microscopic identification is discussed. The microscope can be used to detect soap formation, the painting system used, and the effects of water. A staining technique on paint film sections has been developed. Three references.

1291. Eastman kodak company, Rochester, N. Y. *Photography through the microscope*. Rochester, N. Y., 1952. 68 pp., illus. (part col.), tables.

Contents: Applications; Magnification; The microscope; Resolution; The microscope and the camera; Equipment; Photographic materials for photomicrography; Illumination of the subject; Filters;

Procedure; Determination of the correct exposure; Special techniques; Text references; Data sheets; Bibliography; List of manufacturers.  
BMU

1292. EHRLICH, EVELYN SELTZER. Photomicrography as bibliographical tool. *Indian Archives*, 4 (1950), pp. 35-39, illus. Reprinted from *Harvard Lib. Bull.* 4, no. 1 (Winter 1950).

Details are given for making photomicrographs, rapidly and inexpensively, with a Leitz Ultropak microscope and a Land Polaroid camera. These are useful in recording and in demonstrating imitations and forgeries in printed works. Three cases of employment are cited.  
RJG

1293. FONBRUNE, PIERRE D. DE. *Technique de micromanipulation*. Paris, Masson et C<sup>ie</sup>, 1949. 203 pp. (Monographies de l'Institut Pasteur)

Contents: Introduction; Le micromanipulateur pneumatique; La microforge; Travaux a la microforge; Les microinjections; Agencement des préparations—La Chambre a huile; Pratique des micromanipulations; Bibliographie; Index.  
BMU

1294. FRANKLIN, G. L. A rapid method of softening wood for microtome sectioning. *Trop. Woods*, no. 88 (1946), pp. 35-36.

1295. FULLER, M. L., BRUBACKER, D. G., and BERGER, R. W. Mounting of pigments for electron microscopy. *J. Applied Physics*, 15 (1944), p. 201; *C.A.*, 38 (1944), 1948.

A technique is described for obtaining a thin supporting membrane and well-dispersed pigment particles, such as ZnO, TiO<sub>2</sub>, ZnS, and lithopone. Approximately 0.01 g. of pigment is mulled into three drops of 1 percent (vol.) poppyseed oil in AmOAc (I). To this nearly dry paste are added 3 drops of 2 percent (wt.) nitrocellulose in I. This is mulled until the solvent has evaporated. About 8 drops of 2 percent (wt.) nitrocellulose in iso-PrOAc (II) is added and mulled till the pigment is in suspension. One drop of this is allowed to spread on the surface of a saturated aqueous solution of NaCl. A portion of the film is removed on a glass slide and refloats in water to wash away the salt, and then attached to the standard 200-mesh screen disk. II is superior to I in preparing the suspension, because flocculation occurs when the latter is used.

1296. GRABAR, DONALD G., and MCCRONE, WALTER C. Application of microscopic fusion methods to inorganic compounds. *J. Chem. Educ.*, 27 (1940), pp. 649-653; *C.A.*, 45 (1951), 7825c.

Construction details of a hot stage (temps. < 500°) and of a micro-furnace (temps. > 500°) which can be used with a microscope to study inorganic substances in the same way as organic compounds have been studied previously.

1297. GRAFF, JOHN HENRY. *Microscopy of pulp and paper*. Appleton, Wis., 1952. 398 pp. (Institute of paper chemistry. Bibliographic series, no. 177). Processed.

Contains 1,370 references mostly with abstracts of books, pamphlets, and periodical literature. Author index. Subject index.

1298. Gt. Brit. Dept. of scientific and industrial research. *The preparation of wood for microscopic examination*. London, HMSO., 1951. 8 pp. illus. (Gt. Brit. F.P.R.L. Leaflet, no. 40.)

1299. GRECO, JACQUELINE P. Refractive indices of currently used mounting media. *Stain Tech.*, 25 (1950), pp. 11-12, table.

Refractive indices  $n_D/20^\circ \text{C}$ . are given for 24 resinous media, 6 solvents, and 9 water-soluble media. Commercial sources, lot number, and percent of substance by weight are also listed. RJG

1300. GROAT, RICHARD A. Preparation of copolymers of isobutyl methacrylate and styrene for mounting media. *Stain Tech.*, 25 (1950), pp. 87-94, table.

Details are given for the preparation of low molecular weight copolymers of isobutyl methacrylate and styrene for use in mounting microscopical sections between the slide and cover glass. Any refractive index in the range from 1.477 to 1.590 is available, depending upon the proportions of monomers used. A refractive index of 1.550 is recommended for general purposes, though other indices might be desirable in special cases including phase microscopy. The resin gives solutions in toluene of suitable fluidity at usable concentrations, adheres satisfactorily to glass, and has excellent light-transmission. The features which make it especially valuable are its optimum refractive index and its permanent water whiteness.

Copolymers of isobutyl methacrylate and styrene may also be used to prepare plastic mounts of thick sections or gross specimens, which are optically cleared by the plastic mountant. Author's abstract.

1301. HALLIMOND, A. F. Use of "Polaroid" for the microscope. *Nature (London)*, 154 (1944), pp. 369-370.

A brief report on the properties of improved "Polaroid" discs, which rival those of the best nicol prisms, particularly in their use with the petrological microscope. Extinction curves and chromatic characteristics are given. LB

1302. HAUSER, ERNST A., and LEBEAU, D. S. Microscopic studies of lyogels—ultra-illumination by incident light. *Ind. Eng. Chem.*, 37 (1945), pp. 786-789; *C.A.*, 39 (1945), 4278.

A new technique is described for the microscopic examination of lyogels, by use of ultraillumination by incident light as obtained with an "Ultropak" ultramicroscope. Results obtained by this technique with natural and synthetic rubber, soap, and other lyogels are dis-



cussed. These results substantiate the assumption that the morphology of lyogels of quite different chemical composition is very similar, thus offering an explanation of the analogy of some of their properties. Several photomicrographs are reproduced as examples of the applicability and versatility of this simple technique.

1303. HAUSER, ERNST A. The Polaroid Land camera; a new tool for education and research. *J. Chem. Educ.*, 26 (1949), pp. 224-225, illus.

Simple equipment is described for mounting the camera over a microscope. Finished-print photomicrographs can be produced one minute after exposure. If one wants to have the camera already in position for exposure and still be able to check the focus, a Leitz Micro-Ibso attachment with its standard focusing lens removed can be attached to the eyepiece. RJG

1304. KEHL, GEORGE L., and CHURCH, JAMES S. Room-temperature casting resin for metallographic mounts. *Metal Prog.*, 50 (1946), pp. 1089-1090; *C.A.*, 43 (1949), 6861.

Methyl methacrylate monomer is treated with a 5 percent solution of NaOH to remove the stabilizer (quinol) and then dried over anhydrous  $\text{Na}_2\text{SO}_4$ . Benzoyl peroxide (0.1 percent) is dissolved in the dry monomer to act as a polymerization catalyst, and the solution set aside for 15 hours and filtered; 10 percent of the powdered polymer is then dissolved in the liquid by heating at  $80^\circ$  until the solution acquires the viscosity of concentrated  $\text{H}_2\text{SO}_4$  by polymerization. After cooling in an ice-bath, the partly polymerized resin may be cast, or preserved for about 30 days by storing at low temperature in a stoppered bottle. The mounting procedure is similar to that employed with acid-hardening resins, but allowance must be made for shrinkage during hardening. Polymerization is accelerated by warming the mount to  $50^\circ$ , the full hardness being developed in 2-3 hours.

1305. KENNEDY, GEORGE C. The preparation of polished thin sections. *Econ. Geol.*, 40 (1945), pp. 353-360; *C.A.*, 39 (1945), 4301.

Difficulties in preparing polished thin sections are overcome by the use of thermoplastics glycol phthalate or Gelva V 7. Details of procedure are given.

1306. KOCH, HAROLD C., BRANDON, C. E. and GEOHAGEN, K. P. The microscopic identification of paper fillers. *Tappi*, 34 (1951), pp. 265-269; *C.A.*, 45 (1951), 8767g.

Photomicrographs and descriptive information are given for the identification of the common paper fillers, such as diatomaceous earth, talc, clay,  $\text{CaSO}_4$ , and Zn, Ba, and Ti compounds.

1307. KOZLOWSKI, RUDOLF. Les microorganismes de l'époque crétacée aident à établir la différence entre les techniques de la peinture sur

crepi. *Ochrona Zabytków*, 3 (1950), pp. 93-104, illus. Polish text with French summary.

A method is given for distinguishing among different forms of calcium carbonate in paintings done on plaster, especially the chalk used as a white pigment from the lime binder which is used in "fresco secco" technique. In the chalk, which is of marine origin, one can observe microscopically tiny fossil forms called coccoliths, rhabdoliths and asteroliths. (These forms are shown at 600 $\times$  magnification in eight photomicrographs.) On the other hand, lime which is prepared from limestone by heating and slaking shows no fossil forms. RJG

1308. LEFÈVE, R., and SNEYERS, R. La microchemie des peintures anciennes; une nouvelle methode de preparation des coupes. *Mededeel. Vlaam. Chem. Ver.*, 12 (1950), pp. 99-101.

An improved method is described for the preparation of cross-sections of old paintings. Monomeric methyl methacrylate with 3 percent benzoyl peroxide is placed to a depth of 1 cm. in an ordinary test tube and is polymerized for 24 hours at 50° C. The tiny paint specimen is laid on the surface of the clear polymer near the side of the tube. The specimen is covered with a paste of methyl methacrylate monomer and granules of polymer. The purpose of the paste is to keep the tiny specimen in proper position and orientation. Impregnation of the specimen is effected by alternately applying vacuum and pressure at the mouth of the test tube. After the paste is hardened by polymerization of the monomer the test tube is broken away to release the mounted specimen. Because of the transparency of the mount it is possible to determine the orientation of the specimen and then to file or grind away the polymer in a plane at right angles to the paint layers. Surfacing is completed by hand grinding on emery papers and polishing on a metallographic lap. Specimens 0.5 mm. in greatest dimension may be polished this way. The layers of cross-sections can be photomicrographed up to magnifications of 300 $\times$ . Specimens may be examined at higher magnifications by using a cover glass and glycerine as a mounting medium. RJG

1309. LILLIE, RALPH D., WINDLE, WILLIAM F., and ZIRKLE, CONWAY. Interim report of the Committee on histologic mounting media: Resinous media. *Stain Tech.*, 25 (1950), pp. 1-9.

The Fisher "Permout" naphthalene polymer, the Hartman Leddon "H.S.R." terpene polymer resin, a Monsanto polystyrene P-1, the Will Corporation "Diaphane" and "Green Diaphane," and the du Pont "Lucite" methyl methacrylate polymer were examined, and the possibility of use of some other plastics was also explored. The first five mentioned were tested for color preservation of a variety of stains in comparison with Canada balsam and Clarite X. From this point of view polystyrene, the Hartman Leddon "H.S.R." and the Fisher "Permout" resins were the most satisfactory, then the "Diaphanes." Both "Permout" and "H.S.R." show some yellowing. The H.S.R. with

a melting point of 115° C, the Permunt with 150° C. melting point, and the Polystyrene with a thermal denaturation point above 220° C. all excel Canada balsam in heat resistance. Trimethylbenzene, cymene and monoamylbenzene appear to be the best solvents for polystyrene. Mounts made in a solution of 20 g. polystyrene in 100 ml. trimethylbenzene can be packed flat slide to slide in 24 hours after mounting without sticking together. Authors' abstract.

1310. MASSAZZA, FRANCO. Microscopic structure of special porcelains. *Ceramica*, 6 (1951), 38-42; *C.A.*, 46 (1952), 2768a.

The percentages of quartz, mullite-rich glass, and pure glass were determined on polished sections of different German, Chinese, Japanese, and American porcelains by measurements in reflected light. Also the pores were determined. One American hotel china was different, showing 10 percent leucite as a crystal phase in the body. The glass content varied between 15 and 50, the quartz between 10 and 45, and the mullite-rich portions between 15 and 65 percent (the latter in Rosenthal porcelain). From the known firing temperatures of the German and American porcelains, those of Chinese and Japanese (ancient and modern) could be estimated approximately as 1250-1400°. The microscopic method used is that of Tavasci (*C.A.*, 30, 7800<sup>4</sup>; 43, 5561<sup>7</sup>); the etching was usually done with dil. HF (1:20). Only the American hotel china containing leucite was etched with hot concd. HCl. Mullite aggregates with a characteristic laminar structure indicate their origin from the sheet structure of coarse kaolinite or, even more often, of mica in raw batches. Residual quartz often shows cracks which separate the crystal phase from the surrounding siliceous glass, by contraction effects. In Chinese porcelains, a characteristic formation of glass "nuclei" inside the quartz indicates the porphyric or micropegmatitic origin. The leucite in the American porcelain is derived from feldspar by its incongruent fusion at 1170°. The inversion of quartz to tridymite or cristobalite above 1400° is observed only in the high-fired German porcelains, but absent in the evidently lower-fired Oriental products.

1311. MEHLENBACHER, VIRGIL C. Fat and oil microscopy. *Inst. Spokesman*, 5 (1941), pp. 1-4, 6-7; *C.A.*, 37 (1943), 4587.

Fats and fatty oils can be identified under the microscope by the examination of the crystal habit of the respective fat acid mixtures derived therefrom. Photomicrographs are given for the fat acids from lard, beef tallow, cottonseed oil, kapok oil, rice bran oil, palm oil, babassu oil, olive oil, sardine oil, whale oil and coconut oil. Teaseed oil can be identified by the crystals formed on a slide from the fat acids and KOH in BuOH; corn oil and perilla oil can be identified in a similar fashion. In some cases the microscopic technique can be applied to mixtures of fatty oils while in other cases the oils lose their identity when mixed.

1312. MEYROWITZ, ROBERT. A new version of immersion liquids. *Amer. Miner.*, 37 (1952), pp. 853-856.

A new series of high-index immersion liquids ( $n=1.66-1.81$ ) has been made which employs  $\alpha$  bromonaphthalene and a 10 percent solution of precipitated sulphur dissolved in arsenic tribromide. These have the advantages over methylene-containing solutions in that they are more stable; they remain light yellow in color over a period of months. After a period of nine months the maximum change of index was  $\pm 0.001$ . Detailed directions are given for preparation.

RJG

1313. MEYROWITZ, ROBERT, and LARSEN, ESPER S., JR. Immersion liquids of high refractive index. *Amer. Miner.*, 36 (1951), pp. 746-750.

A new series of high-index immersion liquids ( $n=1.74$  to  $2.00$ ) has been made. The  $1.74$  to  $1.81$  liquids contain methylene iodide, precipitated sulphur and arsenic tribromide. The mixing curve is not a straight line. Those from  $1.82$  to  $2.00$  contain arsenic tribromide, precipitated sulphur and arsenic disulphide. This mixing curve is a straight line. The temperature coefficient of the liquids is of the same order of magnitude as that of methylene iodide but the dispersion is higher. The liquids are light in color and have satisfactory keeping qualities. Detailed directions are given for preparation.

RJG

1314. MILLER, LEWIS B. Dispersion of pigments and fillers for microscopic examination. *Paper Trade J.*, 116 (1943), pp. 39-42; *C.A.*, 37 (1943), 1267.

In the microscopic examination of paper pigments, fillers, etc., difficulty is frequently encountered in effecting a uniform and satisfactory dispersion of the powders so that particle size and shape and their variations may be readily determined under the microscope. A new and simplified method for the preparation of slides, in which this effect is overcome, is described in detail. It consists essentially in thoroughly drying the powder at  $220^{\circ}$  F. or higher (if affected by this temperature, the material should be dried as thoroughly as its properties permit), placing 1-2 drops of a solution of 1.94 g. of parlodion (purified pyroxylin in flakes) in 82 g. amyl acetate, 6 g. ether, and 4 g. absolute alcohol., directly on the powder on a microscope slide, rubbing with a small spatula to disperse the powder in the solution, causing a single drop of the dispersion to fall on the surface of a beaker or pan of water, allowing the resultant film to stand for 1-2 minutes, transferring a suitable portion of the film to a microscope slide, removing adherent water with a paper towel or blotter, and drying in an air current at about  $130^{\circ}$  F. The slide remains satisfactory for at least several hours and probably for several days if stored in a desiccator. The slide may be rendered permanent by treating with a solution of 60 percent of Clarite synthetic resin in toluene and covering with a cover glass. A number of comparative photomicrographs are reproduced to show the merits of the procedure.

1315. PETRYN, ANDREW FRED. Restoring old masters. *Leica Photo.* 5, no. 3 (1952), pp. 4-5, 28-29, illus. (part col.)



Interesting illustrations in color showing how the 35-mm. camera with Leitz Micro-Ibso attachment and Ultropak can be used to record details of paint structure and conditions. RJG

1316. PHILLIPS, E. W. J. *Identification of softwoods by their microscopic structure*. London, H.M.S. Off., 1948. 56 pp., illus. (Gt. Brit. F.P.R.L. Bulletin, no. 22.)

The subject matter of this bulletin was originally published in the *Journal of Linnean Society (Botany)*, v. 52, no. 343 (1941), under the title: The identification of coniferous woods by their microscopic structure. It was amended when published in the bulletin.

1317. RENDLE, R. J., and FRANKLIN, G. L. Identification of plywood glues. *J. Soc. Chem. Ind.*, 62 (1943), pp. 11-14.

With the aid of microscopic and staining techniques, and simple physical and chemical tests, animal or hide glues, blood-albumin, casein, and modern synthetic resin glues may be distinguished. LB

1318. RICHARDS, OSCAR W. Phase difference microscopy. *Nature (London)*, 154 (1944), p. 672, illus. (A letter to the editor.)

Insertion of a suitable annular stop in the condenser makes possible the examination of, e.g., transparent fibres against a colourless background by converting phase differences into intensity differences. LB

1319. RIGBY, G. R. *The thin-section mineralogy of ceramic materials*. London, British refractories research association, 1948. 179 pp., illus., tables. Rev. ed. 1953.

Contents: The preparation of thin sections; The identification of mineral phases; Optical properties of minerals found in ceramic materials, slags, glasses, and sinters; Determinative tables; Appendices (White's test; Bibliography; Reference to photographs); Index.

Reviewed in: *J. Amer. Ceram. Soc.*, 32 (1949), p. 31.

RMO

1320. ROYER, GEORGE L., and MARESH, CHARLES. The application of microscopy to the textile field. *J. Soc. Dyers Colourists*, 63 (1947), pp. 287-293, illus. (part col.).

A lecture in which is described with abundant illustrations some newly developed methods for mounting, cutting, and staining textile fibres, and applications to dyeing, printing, and fabric finishing. Twenty-four photomicrographs in color of cross sections of textile fibres are shown. RJG

1321. ROYER, GEORGE L., MARESH, CHARLES, and HARDING, ANNA M. *Microscopical techniques for the study of dyeing*. Bound Brook, N. J., 1946. 41 pp. incl. pls. (part col.). (American Cyanamid Company, Calco Technical Bulletin, no. 770.)

Contents: Views of the Calco microscopical laboratory; Introduction; Technique for cross-sectioning textiles; Technique for cross-sectioning

tioning leather; Color photomicrographic technique; Photomicrography in polarized light; Photomicrography in fluorescent light; "Optical staining"; Small objects and low-power color photography; Photomicrography in black and white; Bibliography. BMU

1322. SCHAEFFER, HAROLD F. *Microscopy for chemists*. Toronto, New York, London, D. Van Nostrand Company, Inc., c1953. 264 pp., illus.

Contents: Preface; Principles governing lenses; Getting acquainted with the microscope; Properties of objectives and oculars; Illumination: Equipment and principles; Permanent records: Preparation of sketches and photomicrographs; Quantitative microscopy; Polarized light: Principles, sources, and applications; Chemical procedures on a microscopic scale: General (and) Inorganic reactions; (and) Organic reactions; Laboratory experiments; Bibliography; Index.

Reviewed in: *Chem. Eng. News*, 32 (1954), p. 1816, by R. N. Titus. BMU

1323. SCHÄTZER, L. Microscopic methods for ceramics. *Glashütte*, 76 (1950), pp. 141-143; *C.A.*, 44 (1950), 7500.

Report on staining methods for the examination of glazes and ceramic bodies. Original dyestuff staining, combined with etching, gives evidence not only for the determination of the mineral composition, but also on the adhesion of glazes to bodies, etc.

1324. SHILLABER, CHARLES PATTEN. *Photomicrography in theory and practice*. New York, John Wiley & sons, inc.; London, Chapman & Hall, Ltd., c1944. viii, 773 pp., illus., tables.

Contents: The microscope—nomenclature and definitions, Laboratory work. Questions; Lamp houses, lamps, methods of lighting, and photometric units. Laboratory work. Questions; Light, lenses, images and objectives. Laboratory work. Questions; Oculars, illuminating apparatus, slides, cover glasses, and the effect of dirt on the optical system. Laboratory work. Questions; Optical light filters and the control of glare. Laboratory work. Questions; Cameras, photosensitive material, formulae and photographic technique. Laboratory work. Questions; Mounting media, stains, reagents, and solvents—their use and application in photomicrography; Analysis of practical photomicrographical problems; Glossary; Addendum; Index. BMU

1325. SMITHSON, FRANK. The application of phase-contrast microscopy to mineralogy and petrology. *Mineralog. Mag.*, 28 (1948), pp. 384-391; *C.A.*, 43 (1949), 4603.

A phase-retarding plate in the microscope objective produces a phase diff. of  $\frac{1}{4}$  wave length of green light. A mineral immersed in a liquid of lower  $n$  has dark edges adjacent to the brighter index oil. Relief effects are enhanced. The phase contrast objective plus a single polarizer produces upon rotation of the microscope stage a considerable change in the clearness of boundaries, especially with adjacent birefringent minerals with similar mean  $ns$ .

1326. STOCK, E. Microscopic and microphotographic studies on coating materials. *Dtsch. Farben Z.*, 5 (1951), pp. 274-278, 307-309; *Abstract Review*, no. 182 (1952), p. 166.

Photomicrographs of paint coatings and of cross-sections made with the microtome are shown in numerous illustrations. The value of microscopic evidence in complaint cases is discussed.

1327. STOVES, J. L. The histology of mammalian hair. *Analyst*, 67 (1942), pp. 385-387; *C.A.*, 37 (1943), 1347.

A procedure for examining transverse and longitudinal sections of animal hair for the purpose of identification in legal cases is described and illustrated, as is a procedure for examining the superficial scale structure. The paper will be of interest to all analysts who are called upon to identify the species of hair in criminal cases.

1328. TILLEARD, D. L., and SMITH, N. D. P. Examination of pigments and extenders with the electron microscope. *J. Soc. Chem. Ind.*, 65 (1946), pp. 305-308; Cf. *C.A.*, 41 (1947), 1112d; *C.A.*, 41 (1947), 2912.

Data are presented showing a comparison between the particle size and shape of several pigments and extenders as given by the electron microscope with similar values for the optical microscope and, in certain cases, adsorption methods. The following materials were studied: Zn oxides (direct process, acicular, French or indirect process, "colloidal"), Pb chromates (primrose, lemon, middle, orange), white leads (chamber, stack, electrolytic), lithopone, ZnS, TiO<sub>2</sub> (anatase, rutile), Fe oxides (yellow synthetic, Turkey red), ultramarine, Monastral blue, Prussian blue, China clay, and bentonite. The adsorption method gives results which are in good agreement with those obtained with the optical microscope, but sometimes the values are larger than those estimated by the electron microscope. The latter instrument gives the following additional information: knowledge of the shape of those small particles not completely resolved by the optical microscope, evidence of the existence in certain pigments of smaller particles than previously known, some detail of the surface of the larger particles, and evidence of the existence and shape of extremely thin platelike particles, transparent to visual examination, and possibly only a few mols. thick. The appearance of the above materials under the electron microscope at 14,000 diameters is illustrated by 17 micrographs.

1329. TOOMBS, H. A., and RIXON, A. E. Use of plastics in the transfer method of preparing fossils. *M.J.*, 50 (1950), pp. 105-107; *C.A.*, 45 (1951), 4975b.

Exposed bone in limestone matrix is cleaned in 20 percent AcOH, then placed face up in a mold which is filled with cold polymerizable plastic (Marco Resin S.B. 26C). After 24 hours excess resin adhering to the back of the matrix is cut or ground away. The excess rock

matrix behind is removed by immersion with 20 percent AcOH. The specimen is then worked and when dry, painted with a diluted solution of celluloid in  $\text{Me}_2\text{CO}$  and Am acetate. The fossil then is freely exposed with its base securely anchored in the clear plastic.

1330. U. S. Food and drug administration. *Microanalysis of food and drug products*. Washington, Govt. print. off., 1944. (*Its Circular*, no. 1), 171 pp.

This bulletin gives much information on microscopic identification of miscellaneous products as animal hairs, insects and insect pests, molds, and all types of dirt and filth. It describes many methods for isolating and examining these materials. RJG

1331. VARICAK, TEODOR. Production of pine resin balsams for microscopical and optical uses. *Stain Technol.*, 26 (1951), pp. 225–229, tables.

The optical properties, specific gravity, and other properties inherent in a mounting medium are described for balsams made from the crude resins of Yugoslav pines and are compared with those of Canada balsam and other commonly used media. RJG

1332. WEST, PHILIP W. Methods for determining refractive indexes in polarized light microscopy. *Science*, 101 (1945), pp. 283–284; *C.A.*, 39 (1945), 5207.

For isotropic samples the usual Becke line or half-shadow methods are satisfactory but with anisotropic crystals, the customary order of procedure is reversed. First locate a particle which shows an interference figure under conoscopic observation and from this determine its optical class and optic sign. Next, determine  $n_s$  on crystals showing the maximum flash of color during rotation between crossed nichols. Rotate such a crystal to extinction, remove the analyzing prism and note either the high or the low index. Rotate  $90^\circ$  and determine the other index. If the crystals are uniaxial positive, the lower index will approximate the value for  $\omega$ ; if the crystal is negative, the  $\omega$  index will be very near the higher value. With biaxial positive crystals, the  $\beta$  will be nearer  $\alpha$  than  $\gamma$  but in negative crystals it will be nearer the latter. The value of  $\beta$  can usually be estimated from these relationships. The  $\beta$  value can be checked on a crystal with an interference figure in the optic north-south position. The  $\omega$  index of uniaxial crystals can be made on crystals that show centered interference figures.

1333. WILDMAN, A. B. The microscopy of textile fibers—aids to their identification. *J. Textile Inst.*, 38, no. 10 (1947), pp. 468–473; *C.A.*, 42 (1948), 1058.

An address. Photomicrographs of horse hair, cow hair, wool, cashmere, and llama fibers are given.

1334. WILSON, NORVAL F. A new stain for identifying papermaking fibers. *Pap. Ind. and Paper World*, 27 (1945), pp. 215–216; *C.A.*, 39 (1945) 3664.



The stain is prepared as follows: I crystals 0.8 g.,  $\text{CdI}_2$  35.0 g., distilled water 50.0 cc.; when solution is complete at  $110^\circ\text{F}$ . add the following in order: distilled water 90 cc., formaldehyde 7 cc.,  $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$  70 g.,  $\text{CdCl}_2 \cdot 2\frac{1}{2}\text{H}_2\text{O}$  20 g. Colors produced on the chief papermaking fibers are: soda, purple; linen rag, pink; kraft, brown (some gray); groundwood, yellow; unbleached sulfite, colorless; bleached sulfate, blue; bleached sulfite, lavender; cotton, red; straw, green predominates. A sample for examination is conveniently prepared by cutting out with a small hand punch disk samples about  $\frac{3}{16}$  in. in diameter from the sheet to be examined, disintegrating by shaking in a miniature ball mill consisting of a stoppered test tube containing a few glass beads and the proper amount of distilled water as determined from the weight of the sample.

1335. WINCHELL, HORACE, and WALTON MATT S. An inexpensive petrographic microscope. *Amer. Mineral.*, 34 (1949), pp. 688-691.

Directions are given for using Polaroid films to convert a student or medical microscope. A working drawing is shown for a rotating stage that can be easily turned out of  $\frac{1}{8}$ -inch brass stock and fixed to a square stage by using the holes provided for stage clips. RJG

#### C. RADIATION ANALYSIS (X-RAY, INFRARED, ULTRAVIOLET, AND VISIBLE RANGE)

1336. AKIYAMA TERUKAZU. Optical methods of studies on art objects. *Museum (Tokyo)*, No. 14 (1952), pp. 27-30, illus. (In Japanese.)

A review of X-ray, infrared, and ultraviolet methods applied to Western as well as Eastern art. Research along these lines has been carried out in Japan since about 1952. Since the war interest in use of optical methods has been greatly stimulated. HPS

1337. CLAUSER, H. R. *Practical radiography for industry*. New York, Reinhold Publishing Corp., 1952. 301 pp., illus.

Contents: Introduction; Nature, characteristics and properties of X-rays; The generation of X-ray and X-ray equipment; Procedures and radiograph interpretation; Exposure factors and technique; Sensitivity and radiograph quality; Films and film processing, screens and filters; Gamma-ray radiography; Radiography of welds; Radiography of castings; Fluoroscopy; High-voltage radiography; Other techniques and applications of radiography; Protection and safety; General index. BMU

1338. COMSTOCK, HELEN. Science verifies an attribution to Carpaccio. *Connoisseur*, 109 (1942), p. 63; 117 (1946), pp. 42-44.

A note on the evidence obtained by infrared photography of Vittorio Carpaccio: *The Mediation on the Passion* (Metropolitan Museum of Art). The Carpaccio signature appeared beneath a later Mantegna signature, confirming the stylistic attribution previously made. SRJ

- 1338a. CROWTHER, JAMES ARNOLD, editor. *Handbook of industrial radiology*, by members of the Industrial radiology group of the Institute of Physics. 2d ed. London, Edward Arnold & Co., 1949. viii, 219 pp., illus.

Contents: Preface; The physical principles of industrial radiology; Requirements in design of industrial X-ray equipment; Quantitative measurements in industrial radiology; The response of photographic materials to X-rays; The radiography of heavy metals; The radiography of light metals; Gamma radiography; Some uncommon applications of industrial radiography; X-ray protection; Appendix—Linear absorption coefficients; Index. BMU

1339. DÉRIBÉRÉ, MAURICE. Application of fluorescence phenomena to the study of pigments. *Chim. peintures*, 5 (1942), pp. 137–141; *Review*, 19 (1946), p. 3.

Tables are given, showing the color of fluorescence of many pigments in ultraviolet light. The colors may be used for the identification of pigments, particularly in dried paint films, but it is pointed out that some pigments show a considerable variation in fluorescent color according to their mode of preparation (temperature of calcination, etc.) while impurities also have a pronounced effect.

1340. DÉRIBÉRÉ, MAURICE. *Les applications pratiques des rayons infrarouges*. Paris, Dunod, 1943. 222 pp., 163 illus.

Vues générales sur l'IR, Production de l'IR; Filtration et séparation des diverses radiations; Réflexion de l'IR; Transmission et absorption; La photographie IR; Le séchage par rayonnement IR; Cellules photoélectriques; Relations entre l'IR et la luminescence: Applications biologiques, physiologiques et thérapeutiques. PC

1341. DÉRIBÉRÉ, MAURICE. *Les applications pratiques des rayons ultraviolets*. Paris, Dunod, 1947. 247 pp., 129 illus.

Vues générales sur l'UV; Mesure et détection du rayonnement UV; Production des rayons UV; Filtration de l'UV; Réflexion de l'UV; La photographie UV; Transmission et absorption; Application des spectres d'absorption; Effets germicides et abiotiques des rayons UV; Photochimie; Photolyse, Photosynthèse; Biologie, physiologie, phyto-biologie. PC

1342. DÉRIBÉRÉ, MAURICE. Fluography. *Museum (Paris)*, 3 (1950), pp. 180–181, illus.

A method is described for reproducing images of engravings, intaglios, hollow objects, etc. by covering them with a fluorescent product and photographing in ultraviolet light. NLB

1343. Eastman kodak company, Rochester, N. Y. *Infrared and ultraviolet photography*. 4th ed. Rochester, N. Y., 1951. 40 pp., illus., tables.

Contents: Infrared radiation and the spectrum; Infrared-sensitive films and plates; Filters; Practice of infrared photography; Special uses; Handling and processing infrared materials; Recommended formulas; Specifications—Kodak infrared sheet film (and) Kodak infrared (IR135) film; Ultraviolet photography; Selected references.

BMU

1344. Eastman kodak company. *Radiography in modern industry*. Rochester, N. Y., c1947. 122 pp., illus.

Contents: Radiography's function in industry; The radiographic process; X-ray generating apparatus; Geometric principles; Factors governing exposure; Radiographic screens; Scattered radiation; Arithmetic of exposure; Sensitivity and detail visibility; Special technics; Kodak industrial x-ray films; Processing; The processing room; Appendix I—Sensitometric characteristics; Appendix II—Protection; Appendix III—Unsatisfactory radiographs; Bibliography; Index. BMU

1345. ELLIOTT, WILLIAM J. The use of Roentgen ray in the scientific examination of paintings. *Amer. J. Roentgenol. Radium Therapy Nuclear Med.*, 50 (1943), pp. 779-790, illus.

The technique of taking roentgenograms of paintings at the Worcester Art Museum are described. Several examples of interesting revelations by this and other means of scientific examination are shown. The author (a physician) calls attention to observations that bear on medical diagnoses of the ills of the sitters for some of the portraits used to illustrate the article.

RJG

1346. GILBERT, RENÉ. A propos du style du Greco, de l'intérêt des rayons X en peinture. *Gaz. Beaux-Arts*, 37 (1950), pp. 91-98, 8 illus. (with English résumé).

Services que peut rendre la radiographie, notamment pour la technique picturale, le style et l'identification. Exemple: Greco. PC

1347. GRANVILLE, WALTER C. Spectrophotometry in evaluating colorants. *Dyestuffs*, 38 (1945), pp. 224-235. *C.A.*, 40 (1946), 5263.

An elementary account of the mechanism of the production of color by substances showing selective absorption is followed by a brief description of the Hardy recording photoelectric spectrophotometer. Reflectance- $\lambda$  curves are shown for linseed-oil paints based on 21 common pigments diluted with ZnO to raise the reflectance at the  $\lambda$  of maximum absorption to 0.15. Such curves can be used for identifying pigments, comparing tinting strength, etc.

1348. HARRISON, VERNON GEORGE W. *Gloss; its definition and measurement*. Brooklyn, N. Y., Chemical Publishing Co., Inc., 1949. 145 pp., illus.

Contents: Abstract; Introduction; Pt. I. Physical factors influencing our sensations of gloss or lustre—Reflexion and refraction from plane surfaces—Reflexion of light from curved and irregular surfaces—Diffuse reflexion—Reflexion from varnished and semi-glossy surfaces—Summary; Pt. II. Physiological and psychological factors influencing our sensations of gloss or lustre—Types of gloss—Binocular lustre—Some psychological experiments—Metallic lustre—Adamantine lustre—Summary. Pt. III. Attempts at practical gloss measurements—The Ostwald-Klughardt method, comments on the method—Polarization methods, comments on the method—The "objective" glossmeter, comments on the method—The Goerz and Askania glossmeters, comments on the method, correlation of polarization and "other type" instruments—Goniophotometers, comments on the method—Distinctness of image measurements, comments on the method—Miscellaneous—Summary. Pt. IV. Discussion: Our present state of knowledge—How does one know that a surface is glossy?—Physical measurements and gestalt properties—Appearances of "Physical realities"?—Future research—Summary; Coda; References. BMU

1349. HOURS, MAGDELEINE. Radiographies de tableaux de Léonard de Vinci. *Rev. Arts*, n° 4 (1952), pp. 227–236, illus.

Résultats de l'examen radiographique de tableaux de L. de Vinci du Louvre, à l'occasion de l'exposition "Hommage à Léonard de Vinci." PC

1350. [Institute of art research, Tokyo.] Studies on art objects through optical methods. *Bijutsu kenkyū*, no. 159 (1950), pp. 174–190, pls., illus.

Contents: Foreword, by Akiyama Terukazu. Tells of a grant in aid to the Institute, beginning 1949 for studies under direction of the author on art subjects by optical methods including radiography, ultraviolet, infrared, and photographic enlargement. Professors from Tokyo and Nagoya universities collaborated in the project; Studies on Buddhist statues by radiography, by Nakayama Hidedaro. X-ray exposure charts are shown for different thickness of Japanese cypress, the wood most widely used in Japanese wood sculpture. With aid of diagrams he discusses the difficulties in interpreting the distorted shadowgraphs obtained in the radiography of solid wood objects. Opaque pigments and gilding on the surface are other variables which add to the difficulties; X-ray experiment on sculpture, by Kuno Takeshi. Dry lacquer statues radiograph easily and disclose the shapes and constructions of the wooden cores. Clay figures require long exposures but show wooden frames and inner details. It is most effective on wooden sculpture, especially on statues of the *yosegi* technique where wood blocks are assembled by mortise and tenon devices. It is possible to attribute the holy relics in the *uchiguri* (hollow interiors) of the statues; Studies on the pigments of ancient Japanese paintings by ultraviolet, by Yamasaki Kazuo. Fluorescent characteristics of various pigments are classified and charted. None of the ordinary pig-



ments used in old Japanese paintings fluoresce except China clay and calcium carbonate. Care must be used in interpreting fluorescence effects because binding materials like glue show strong bluish white fluorescence. HPS

1351. KUNO TAKESHI. Buddhist statues under X-ray. *Bijutsu kenkyu*, no. 163 (1951), pp. 69-75, pls. facsim.

Report of work carried out in 1951 in the radiography of various masterpieces of Japanese sculpture in different materials. HPS

1352. MARCEAU, HENRI, and WATKINS, FRANKLIN C. Beneath the paint and varnish. *Mag. Art*, 37 (1944), pp. 128-134.

Examples of the use of panchromatic and infra-red photographs and of radiographs in studying the painting methods of Daumier, Corot, and Jerome Bosch. RJG

1353. MARCONI, BOHDAN. Roentgenografia Obrazów; Nowe Polskie Urządzenia i Metody. *Ochrona zabytków*, 2 (1949), pp. 25-30, illus., diags.

Special equipment is described for the support of paintings for X-ray and also for the purpose of taking stereo X-rays. There is a summary in French under title "Nouvelle méthode de l'applications des rayons X pour l'examen des peintures," pp. 69-70. RJG

1354. MOURA, ABEL. Os raios infra-vermelhos e ultra-violetas aplicados no exame das pinturas. *Portugaliae physica*, 4 (1946), 9 pp., 18 illus.

Généralités sur l'application des rayons ultra-violet et infra-rouges aux tableaux. PC

1355. PALMIERI, GIAN GIUSEPPE. La ricognizione radiologica a feretro chiuso dei resti di San Domenico. *Pontif. Acad. Sci., Commentationes*, 7 (1943), pp. 733-772, 9 pl.

Recherches radiographiques et stéréoradiographiques appliquées à l'examen des restes de St. Dominique contenus dans un cercueil fermé. Etude surtout anthropologique. PC

1356. PEASE, MURRAY. New light on an old signature. *B.M.M.A.*, n.s. 4 (1945/46), pp. 1-4.

The value of infrared photography was demonstrated in the examination of the *Meditation on the Passion*, which bore a Mantegna signature but which had been attributed on stylistic grounds to Carpaccio. The Mantegna signature was related structurally to a dark, uneven varnish coating which covered certain voids and scars in the paint film. An infrared photograph revealed traces of an earlier Mantegna signature and another signature "vjctorijs carpattij venettj opus." Further microscopic examination revealed that this inscription was imbedded between two layers of the paint forming the label. There was no indication of stratification or of difference in paint structure be-

tween these two layers. The inscription, almost hidden in ordinary light, even after cleaning, was reached by the greater penetration of infrared rays. The Mantegna signature was removed. EHJ

1357. PEASE, MURRAY. A note on the radiography of paintings. *B.M.M.A.*, n.s. 4 (1945/46), pp. 136-139.

The author points out the fallacy of hoping to obtain final answers about the age and authenticity of paintings by "scientific gadgetry." The difficulties in obtaining a clear X-ray pattern of the densities of a paint film when there are obstructions on the back of the panel have been partially overcome by a new technique, traversed focus radiography. The film is mounted in the closest possible contact with the paint film and the panel and film are rotated in the cone of the rays of the stationary X-ray source. The density pattern of the paint layer, in contact with the X-ray film, is recorded sharply while the shadow of an obstruction not in contact with the film moves during the exposure and is either blurred or lost altogether. This technique is estimated to be useful in perhaps 5 percent of the X-rays of paintings. Similar techniques are used in medical X-ray. EHJ

1358. *Queen Isabella de Bourbon*; a lost portrait by Velazquez located. *Connoisseur*, 128 (1951), p. 3. (Editorial).

Radiographs (reproduced) proved the existence of an earlier version of the portrait beneath this companion to the National Gallery 'Silver Philip'. The first version corresponds closely to a contemporary copy in the Copenhagen Museum. SRJ

- 1358a. RADLEY, JACK AUGUSTUS. *Photography in crime detection*. London, Chapman & Hall Ltd., 1948. 186 pp., illus.

Contents: The role of the photographer in crime detection—Theoretical introduction; Cases involving mechanical vehicles; Identification of persons; Criminal cases; The examination of documents of all types; The use of ultraviolet light in police work; Auxiliary apparatus for photography using the ultraviolet region; Photography using ultraviolet radiation; Photomicrography; Photography in infrared; Applications of photography in infrared; X-ray photography; Author index; Subject index. BMU

1359. RAWLINS, FRANCIS IAN GREGORY. Beneath the surface of old pictures. *J. Roy. Soc. Arts*, 41 (1943), pp. 150-154.

The construction of paintings as revealed by X-ray, infrared, and ultraviolet radiations. RJG

1360. VERMEHREN, AUGUSTO. Sulle possibilità stereo-strato-radiografiche di un nuovo tipo di apparecchio a raggi X in dotazione presso l'Istituto Centrale del Restauro in Roma. *Boll. ist. centrale restauro*, 11-12 (1952), pp. 121-133, 14 illus.

Nouvel appareil de rayons X permettant l'obtention de radiographies tridimensionnelles et stratifiées de tableaux. PC

1361. WRIGHT, W. D. *The measurement of colour*. London, Adam Hilger Ltd., 1944. 223 pp.

Contents: Radiation in the visible spectrum—its emission, absorption and reflection; Radiation in the visible spectrum—its reception in the eye; The Trichromatic system of color measurement; Colorimeters—their design and use; Spectrophotometry applied to the measurement of color; The color atlas as a sub-standard of color measurement; Practical applications of colorimetry; Appendix I. Illuminants; Appendix II. The C. I. E. system of color specification; Appendix III. Condensed tables; Name index; Subject index.      BMU

#### D. X-RAY DIFFRACTION ANALYSIS

1362. American society for testing materials. *Alphabetical and grouped numerical index of X-ray diffraction data*. Compiled under the Joint Committee on Chemical Analysis by X-ray Diffraction Methods, of the American Society for Testing Materials, the American Crystallographic Association, and the (British) Institute of Physics. Philadelphia, 1950. iv, 296; iv, 441 pp. (Special technical publication no. 48-B.)

Contents: I. The alphabetical index (white paper): Preface; General inorganic and organic index; Organic index; Minerals. II. The numerical index (blue paper): Preface; Numerical index.      BMU

- 1362a. BIRNBAUM, H., COHEN, H., and SIDHU, S. S. X-ray diffraction of color variation of iron oxide pigments. *J. App. Phys.*, 18 (1947), pp. 27-29, figs.

"Samples of synthetic iron oxide (goethite) taken at regular intervals from a twelve-day continuous process showed progressive change of color, ranging from pale yellow to dark brown. X-ray diffraction, electron microscope, and optical microscope studies lead to the conclusion that the color change in these samples is mostly caused by particle growth."      Authors' abstract

1363. BRINDLEY, G. W. *X-ray identification and crystal structures of clay minerals*. London, The Mineralogical Society, 1951. 345 pp., illus., charts (part fold.).

Contents: Experimental methods, by G. W. Brindley; Kaolin minerals, by G. W. Brindley; Phase changes which occur on heating kaolin clays, by H. M. Richardson; The montmorillonite minerals (montmorillonoids), by D. M. C. MacEwan; The mica minerals,

by R. E. Grim, W. F. Bradley, and G. Brown; The chlorite minerals, by G. W. Brindley and K. Robinson; Vermiculites and some related mixed-layer minerals, by G. F. Walker; Sepiolite, by Mlle. S. Caillère; Palygorskite-attapulgitite, by Mlle. S. Caillère and S. Hénin; Oxides and hydroxides of aluminium and iron, by H. P. Rooksby; X-ray diffraction by structures with random inter-stratification; by G. Brown and D. M. C. MacEwan; X-ray diffraction by randomly displaced layer lattice minerals, by G. W. Brindley; Non-clay minerals in clays, by D. M. C. MacEwan; The interpretation of the composite X-ray powder diagram, by G. W. Brinkley and D. M. C. MacEwan; Mineral and substance index; Subject index; Name index. BMU

1364. KOIDZUMI EIICHI. Nature of the glaze of Japanese porcelains. VI. The *Chirimen-hada* of Arita-yaki. *J. Chem. Soc., Japan*, 64 (1943), pp. 1341-1344; Cf. K., *Ibid.* 62 (1941), p. 559; *C.A.*, 41 (1947), 3596.

The glaze used for the production of the silk-crepelike surface (*Chirimen-hada*) of the earthenware from Arita (*Arita-yaki*) has been subjected to X-ray analysis, and the results are summarized.

1365. SMITH, CHARLES S., and BARRETT, RICHARD L. Apparatus and techniques for practical chemical identification by X-ray diffraction. *J. App. Phys.*, 18 (1947), pp. 177-191, tables.

The method of chemical identification by means of X-ray diffraction is reviewed from the point of view of apparatus and techniques recently made commonly available, with particular emphasis on the use of long wave-length X-radiation. Experience in using the A.S.T.M. card index file of X-ray diffraction data is reported. The discussion is designed especially for the person who wishes to make use of this important analysis tool but who is not an expert in X-ray diffraction.

—Authors' abstract.

1366. WEILL, A. R. Un problème de métallurgie archéologique: Examen aux rayons X d'un objet égyptien en électrum. *Rev. mét.*, 48 (1951), pp. 97-104, illus.

Analyse aux rayons X et par mesure de densité d'un alliage d'électrum constituant un bijou antique égyptien conservé au Musée du Louvre: Introduction; Généralités sur l'analyse aux rayons X des solutions solides; l'Electrum; le Système or-argent-cuivre; Analyse d'un bijou égyptien; Interprétation des expériences; Discussion des résultats; Conclusion. DG

1367. WEILL, A. R. Sur l'hétérogénéité de la solution solide or-argent-cuivre dans un objet antique. *Compt. rend. l'acad. sci. (Paris)*, 232 (1951), pp. 630-632.

Un bijou égyptien en électrum datant du Nouvel-Empire est examiné par diffraction de rayons X et par mesure de densité. Les caractéristiques observées sont comparables à celles décrites par Massins et



Kloiber pour des échantillons d'alliages de composition voisine, analysés aux rayons X. Interprétation des hétérogénéités et conclusion concernant la non-évolution de l'alliage durant plus de quarante siècles. DG

E. ANALYSIS FOR DATING PURPOSES (RADIOCARBON, FLUORINE, AND POLLEN ANALYSIS)

1368. ANDERSON, E. C., ARNOLD, J. R., and LIBBY, W. F. Measurement of low-level radiocarbon. *Rev. Sci. Instr.*, 22 (1951), pp. 225-232; *C.A.*, 45 (1951), 7889b.

The chemical purification and measurement of  $C^{14}$  at natural levels ( $10^{-12}$  curie/g. or less) are described. The chemical cycle involves: (1) conversion of the starting material to  $CO_2$ , (2) precipitation as  $CaCO_3$ , followed by evolution of the purified  $CO_2$ , (3) reduction to elementary C with Mg turnings, and (4) extraction with HCl and  $H_2O$  to remove Mg and  $MgO$ . The counting is done in a screen-wall counter with an  $A-C_2H_4$  filling.

- 1368a. ANDERSON, SVEND T., and BANK, THEODORE P. Pollen and radiocarbon studies of Aleutian soil profiles. *Science*, 116 (1952), pp. 84-86.

Samples for pollen analysis and radiocarbon dating obtained from soil profiles are expected to contribute towards a chronology of post-glacial events in the Aleutians. Because of the climate, pollen and spores are preserved in terrestrial deposits in good condition and in sufficient quantity for statistical analysis, of which examples are given. By correlation of the results on samples from archaeological sites and by radiocarbon dating a picture should be obtained of the climatic and living conditions at the time of the ancient Aleut settlements. ERC

1369. ARNOLD, J. R., and LIBBY, W. F. Age determinations by radiocarbon content: checks with samples of known age. *Science*, 110 (1949), pp. 678-680.

The results of tests on samples of wood dated by other methods are given. Two of the samples were from trees and had been dated by the tree-ring method. The other four were from ancient objects and had been dated from archaeological information. The agreement between the radiocarbon dates and the other dates is regarded as satisfactory. ERC

1370. ARNOLD, J. A., and LIBBY, W. F. Radiocarbon dates. *Science*, 113 (1951), pp. 111-120.

This first extensive report on the estimated dates by the radio-carbon method of materials of mostly unknown or uncertain age shows in tabular form the results of measurements on 160 samples. Most of these samples are from the Americas and over half are from archaeological sites. ERC

1371. ARROL, W. J., and GLASCOCK, R. Conversion of carbon dioxide to acetylene on a micro scale. *Nature (London)*, 159 (1947), p. 810.

Used in connection with  $C^{14}$  work, the method employs pure barium metal heated with the carbon dioxide in a stainless steel vacuum furnace. LB

1372. ATKINSON, R. J., PIGGOTT, STUART, and STONE, J. F. S. Excavation of two additional holes at Stonehenge, 1950, and new evidence for the date of the monument. *Ant. J.*, 32 (1952), p. 19.

Evidence of date by  $C^{14}$  method.

IG

1373. BAKER, H. G. Prehistoric flooding in the Somerset levels. *Nature (London)*, 162 (1948), p. 1208.

Showing the application of pollen analysis to the investigation of four trackways through the raised bogs which lie between the Polden Hills and Wedmore Ridge. RMO

1374. BARTLETT, H. H. Radiocarbon datability of peat, marl, caliche, and archaeological materials. *Science*, 114 (1951), pp. 55-56.

Attention should be paid to the strong possibility that a variety of materials containing carbon that occur in the soil may be grossly contaminated with inactive carbon from interaction with ground water containing calcium carbonate in solution, and even to the possibility that some materials may become enriched in radiocarbon content. Neither marl nor caliche can be dated reliably, and the datability of peat is doubtful. Even charcoal should be washed with acid to remove possible carbonate, and appropriate procedures should be used for other archaeological materials. The object of this article is to warn enthusiasts for radiocarbon dating against assuming that no sources of error exist outside of those inherent in the actual laboratory measurement. ERC

1375. BUSHNELL, G. H. S. Prehistoric America; comments on some  $C^{14}$  dates. *Antiquity*, 25 (1951), pp. 102-103.

1376. COLLIER, DONALD. New radiocarbon method for dating the past. *Chicago Nat. Hist. Mus. Bull.*, 22 (Jan. 1951), pp. 6-7; *Bibl. Archaeol.*, 14 (1951), pp. 25-28; *M.J.*, 51 (1951), pp. 41-43.

A review article on the application of  $C^{14}$  to archaeological problems. The half life of  $C^{14}$  is about 5500 years. The samples are burned and reduced to pure carbon; the radioactivity of the carbon is measured in a specially constructed sensitive radiation counter. The measurement is expressed in the terms of the number of  $C^{14}$  disintegrations per minute per g. of C. This value is 15.3 for contemporary

living samples 5,568 years old and 3.83 for samples 11,136 years old. There is so little  $C^{14}$  in very old specimens that the error in counting is large so that effective range of the method at present is something less than 20,000 years. The year error in dating samples ranges from 5-10 per cent. The minimum amount of pure C necessary for a single counting run (the amount of C placed in the Geiger counter) is  $\frac{1}{3}$  oz. (8g.). It is necessary to have about 2 ounces of plant material or wood, 1-3 ounces of charcoal, 4 ounces of shell, 5-10 ounces of dung or peat and 1 to several pounds of antler or burned bone. For greater accuracy obtained by making 2 independent counting runs  $2 \times$  these quantities are necessary. History of the development of the process is outlined and examples of its application to archaeological problems are given. RJG

1377. CRANE, H. R. Dating of relics by radiocarbon analysis. *Nucleonics*, 9 (1951), pp. 16-23, illus.

The theory of radiocarbon dating is reviewed. The apparatus and technique employed for radiocarbon dating at the University of Michigan is described in considerable detail with pictures and diagrams. The activity of the relic is compared with that of two other  $C^{14}$  samples of known age. RJG

1378. CRANE, H. R., and McDANIEL, E. W. An automatic counter for age determination by the  $C^{14}$  method. *Science*, 116 (1952), pp. 342-347.

The construction and method of operation of a completely automatic counter are described. Drawings of mechanical details and circuits are included. The characteristics of this counter are described with illustrative graphs. Important precautions for the use of  $C^{14}$  counters in general are discussed. ERC

1379. GODWIN, H. Relationship of bog stratigraphy to climatic change and archaeology. *P.P.S.*, 12 (1946), pp. 1-11.

Ecological terms and concepts, effects of climatic change on mire vegetation and stratigraphy, correlations of stratigraphy with pollen-analyses and archaeology. IG

1380. HAMAGUCHI HIROSHI 濱口博, and TATSUMOTO MITSUNOBU 立本光信. Fluorine contents of human bones. *J. Jap. Anth. Soc.*, 61 (1950), pp. 1-4.

Fluorine contents of 10 samples of human bones, of which nine are from various old shell mounds and the last one is of the present time, were determined. Maximum value found was 0.27 percent F. Older bones contain more F than the present one and the ratio  $F/P_2O_5$  appears to increase with the length of time elapsed. KY

1381. HOROVIC, A. Procédé appliqué pour établir l'ancienneté des objets et des localités archéologiques au moyen du carbone radioactif. *Rec. Trav. Protect. Mon. Hist.*, 3 (1952), pp. 13-24.

Twenty-four references.

1382. HYDE, H. A. Pollen analysis and the museums. *M.J.*, 44 (1944), p. 145.

Methods and usefulness.

IG

1383. JOHNSON, FREDERICK (assembled by). Radiocarbon dating; a report on the program to aid in the development of the method of dating. *Amer. Ant.*, 17, Suppl. (1951), pp. 1-65; *Mem. Soc. Amer. Archaeol.*, no. 8 (1951).

Contents: Introduction, by Frederick Johnson; Radiocarbon dates and early man, by Frank H. H. Roberts, Jr.; An assessment of certain Nevada, California, and Oregon radiocarbon dates, by Robert F. Heizer; Some Adena and Hopewell radiocarbon dates, by James B. Griffin; Radiocarbon dating on samples from the Southwest, by William S. Webb; Radiocarbon dates on samples from New York State, by William A. Ritchie; Comments on radiocarbon dates from Mexico, by Helmut de Terra; South American radiocarbon dates, by Junius Bird; The Lascaux cave, by Hallam L. Movius, Jr.; Radiocarbon dates and their influences in the Near and Middle Eastern areas, by Robert J. Braidwood, Thorkild Jacobsen, Richard A. Parker, and Saul Weinberg; Discussion of the geologic material dated by radiocarbon, by Richard Foster Flint; Discussion of the relation of some radiocarbon dates to pollen chronology, by Edward S. Deevey, Jr.; Radiocarbon dating: a summary, by Frederick Johnson, Froelich Rainey, Donald Collier, and Richard F. Flint; Bibliography. RJG

1384. KULP, J. LAWRENCE, and TRYON, LANSING E. Extension of the carbon<sup>14</sup> age method. *Rev. Sci. Instr.*, 23 (1952), pp. 296-297; Cf. Anderson, *et al.*, *C.A.*, 45 (1951), 7889b. See no. 1368a.

By addition of a Hg shield around the Geiger counter used in C<sup>14</sup> age determinations the background count can be reduced from 5 to 2 counts per minute. Thus the limit for determination of the absolute age of natural C is extended from 25,000 to 30,000.

1385. KULP, J. LAWRENCE, FEELY, HERBERT W., and TRYON, LANSING E. Lamont natural radiocarbon measurements. I-II. *Science*, 114 (1951), pp. 565-568.

This is the first report from the Lamont Geological Observatory of Columbia University of measurements of C<sup>14</sup> activity of carbon from modern materials and from samples of archaeological and geological interest. Age determinations of eight archaeological samples are reported; The second report (*Ibid.*, 116 (1952), pp. 409-414) includes age determinations of 18 samples of archaeological and paleontological interest as well as age determinations of a larger number of samples of geological interest. It is shown that the count rate in C<sup>14</sup> determinations is a function of the size of the sample and that carbon samples weighing as little as 0.5 gram may be used, though measurements on such small samples are more difficult and less precise. ERC



1386. LIBBY, WILLARD F., ANDERSON, E. C., and ARNOLD, J. R. Age determination by radiocarbon content: world-wide assay of natural radiocarbon. *Science*, 109 (1949), pp. 227-228.

Results are given of measurements of the  $C^{14}$  activity of carbon from different kinds of recent organic materials, mostly woods, originating in various parts of the world. On the basis of the agreement of the results it is suggested that the  $C^{14}$  activity of carbon from ancient materials may be an index of their age. Test measurements of the  $C^{14}$  activity of carbon from Egyptian wood samples of known age show good agreement with the calculated activity. Tests on younger materials of known age are in progress and the measurement of ancient materials of unknown age is projected for the near future. ERC

1387. LIBBY, WILLARD F. Chicago radiocarbon dates, III. *Science*, 116 (1952), pp. 673-681.

This list covers measurements made in the period from September 1, 1951, to September 1, 1952. Of the 50 samples examined, over half are from archaeological sites. ERC

1388. LIBBY, WILLARD F. Radiocarbon dates, II. *Science*, 114 (1951), pp. 291-296; *C.A.*, 46 (1952), 1355*b*.

Dates established during the period from September 1, 1950, to September 1, 1951, are listed in tabular form. Sixty-two samples, from all parts of the world were measured. Most of these were materials from archaeological sites. ERC

1389. LIBBY, WILLARD F. *Radiocarbon dating*. Chicago, University of Chicago press, c1952. 124 pp., illus.

Contents: Preface; Principles; World-wide distribution of radiocarbon; Half-life of radiocarbon; Preparation of the sample for measurement; Measurement of the sample; Radiocarbon dates; The significance of the dates for archaeology and geology (by Frederick Johnson); Appendix—A. Special equipment and chemicals for the  $C^{14}$  sample preparation apparatus.—B. Special materials for screen-wall counter; Index of subjects; Index of names; Index of samples. BMU

1390. ROBERTS, FRANK HAROLD HANNA. The carbon $^{14}$  method of age determination. *Smithsonian Institution. Annual report of the Board of Regents* . . . 1951, pp. 335-350. Revised with additional material from: *Transactions of the American geophysical union*, 33 (1952), pp. 170-174.

A review of the  $C^{14}$  dating method applied chiefly to the archaeological remains of prehistoric man. The results thus far indicate that: the method is valid and, bearing in mind the expectable error, that a majority of the dates obtained are presumably accurate. Improved methods for collecting samples and greater care in avoiding subsequent contamination probably will sharply reduce the number of unacceptable determinations. Good bibliography. RJG

1391. SELLERS, O. R. Date of cloth from the 'Ain Fashka cave. *Bibl. Archaeol.*, 14 (Feb. 1951), p. 29.

The date determined by the C<sup>14</sup> process for the linen wrappings of the Dead Sea Scrolls is A.D. 33 plus or minus 200 years. This is in agreement with the dating (Hellenistic) of the pottery found in the cave. RJG

1392. SOKOLOFF, V. P., and CARTER, G. F. Time and trace metals in archeological sites. *Science*, 116 (1952), pp. 1-5; *C.A.*, 46 (1952), 9481f.

The suggestion is made that the distribution of certain elements and their amounts should be different in middens than in the surrounding undisturbed soil. Test middens at two localities were systematically sampled at different levels, and the samples were analyzed for chloride, copper, and zinc. The two metals were determined in different types of extracts in order to distinguish between the metals combined in minerals and combined in organic matter. It was found that the copper and zinc content was distinctly different in the midden samples than in corresponding samples from the surrounding soil. Apparently a period of 1,000 to 2,000 years is not long enough to bring the distribution of these trace elements back to that in a comparable undisturbed site. It may be possible to approximate the age of archaeological sites from differences of this kind. ERC

1393. STEWART, T. D. Antiquity of man in America demonstrated by the fluorine test. *Science*, 113 (1951), pp. 391-392.

In view of the present interest in the fluorine content of American animal and human bones as an index of their antiquity, it may be of interest to recall that Wilson in 1895 used the fluorine test to show the antiquity of a human bone found at Natchez. This early work appears to have been overlooked. ERC

1394. STEWART, T. DALE. The fluorine content of associated human and extinct animal bones from the Conkling Cavern, New Mexico. *Science*, 116 (1952), pp. 457-458.

The inconclusiveness of the fluorine test for the bones in this cave is probably due to their deposition under conditions where they could not come in contact with ground water. Attention should be given to this kind of limitation of the fluorine method of dating. ERC

1395. WATANABE NAOTSUNE 渡邊直經. Phosphorus contents of soils of prehistoric sites. *J. Jap. Anth. Soc.*, 61 (1949/50), pp. 1-8.

Vertical and horizontal distributions of P content of soils of prehistoric site in Kitami, Setagaya, Tokyo were determined. P content is high near the prehistoric site. KY

1396. ZEUNER, FREDERIC EBERHARD. *Dating the past; an introduction to geochronology*. 2d. ed. rev. and enl. London, Methuen & co., 1950. 444 pp., illus., maps, diagrs., pls., tables.

Contents: Preface; Introduction; Early history and late prehistory, especially in North America; Dating the metal ages, new and middle stone ages, and the climatic phases which followed the ice-age; Dating the old stone age, the phases of the ice age and the pluvial phases of the warmer countries; Dating the history of the earth and of life before the arrival of man; App. I. Tree-ring analysis; App. II. Correlation of pollen-analytical phases; App. III. Varve dating; App. IV. Radio-active carbon dating; Bibliography; Index.

Reviewed in: *M.J.*, 46 (1946), pp. 182-183.

BMU

1397. ZEUNER, F. E. Dating the past by radioactive carbon. *Nature (London)*, 166 (Nov. 4, 1950), pp. 756-757.

The use of radioactive carbon for the estimation of the age of archaeological objects has attracted widespread attention. Briefly the method relies on the fact that neutrons from cosmic rays are captured by atmospheric nitrogen. The nucleus formed disintegrates immediately, casting out a proton, and a carbon atom of the atomic weight 14 is left. These atoms are radioactive and disintegrate by expelling an electron, the half-life being 5,568—30 years. With the expulsion of the electron the atom reverts to ordinary nitrogen of atomic weight 14. During their period of existence, the atoms of carbon-14 enter into the carbon dioxide of the atmosphere in much the same way as the atoms of normal carbon (carbon-12). The concentration of carbon-14 in the atmosphere is about 10 gm. per gram of carbon-12. Since carbon dioxide provides virtually all the carbon used by plants in building up their tissues, the isotopic composition of carbon in living vegetable matter must be the same as that of atmospheric carbon, and the same applies to living animals, all of which ultimately derive their body material from the plant kingdom. But once an organism is dead, it will no longer receive carbon of atmospheric composition, and its content of carbon-14 will disintegrate according to its half-life period. The proportion of carbon-14 to carbon-12 in dead organic matter, therefore is a direct function of the time elapsed since the death of the organism, and this provides the means of dating the organism by isotopic analysis of its carbon.

The various assumptions on which the carbon-14 method rests are discussed critically. Nevertheless the method is providing answers to some important archaeological problems. Examples are given. RJG

1398. ANDERSON, ERNEST C., and LEVI, HILDE. Some problems in radio-carbon dating. *Kgl. Danske Videnskabernes Selskab. Matematisk-fysiske Meddelelser*, Bd. 27, nr. 6 (1952), 22 pp.

A detailed comparison of the screen wall counter with a gas sample counter with respect to the problems of radio-carbon dating is given. Curves are presented showing the accuracy and range method as functions of the background rate and the counting time. The errors due to intrusion of extraneous carbon are presented and discussed and certain improvements in the method are described. Twenty-four references.—Authors' summary.

1399. ANDERSON, ERNEST C., and LIBBY, W. F. World-wide distribution of natural radiocarbon. *Physical Review*, 81 (1951), pp. 64-69.

Knowledge of the world-wide distribution of radiocarbon in the biosphere is necessary as a basis for radiocarbon methods of geological dating. Mean specific activity was measured on wood samples from widely varying latitudes. The observed mean assay of carbon in equilibrium with the atmosphere is  $16.1 \pm 0.5$  disintegrations per minute per gram of carbon and the fluctuations over the earth's surface are less than 2 percent which is within the experimental error of radioactive measurements. It appears that there has been no considerable variation in cosmic ray intensity over the past several thousand years.

RJG



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